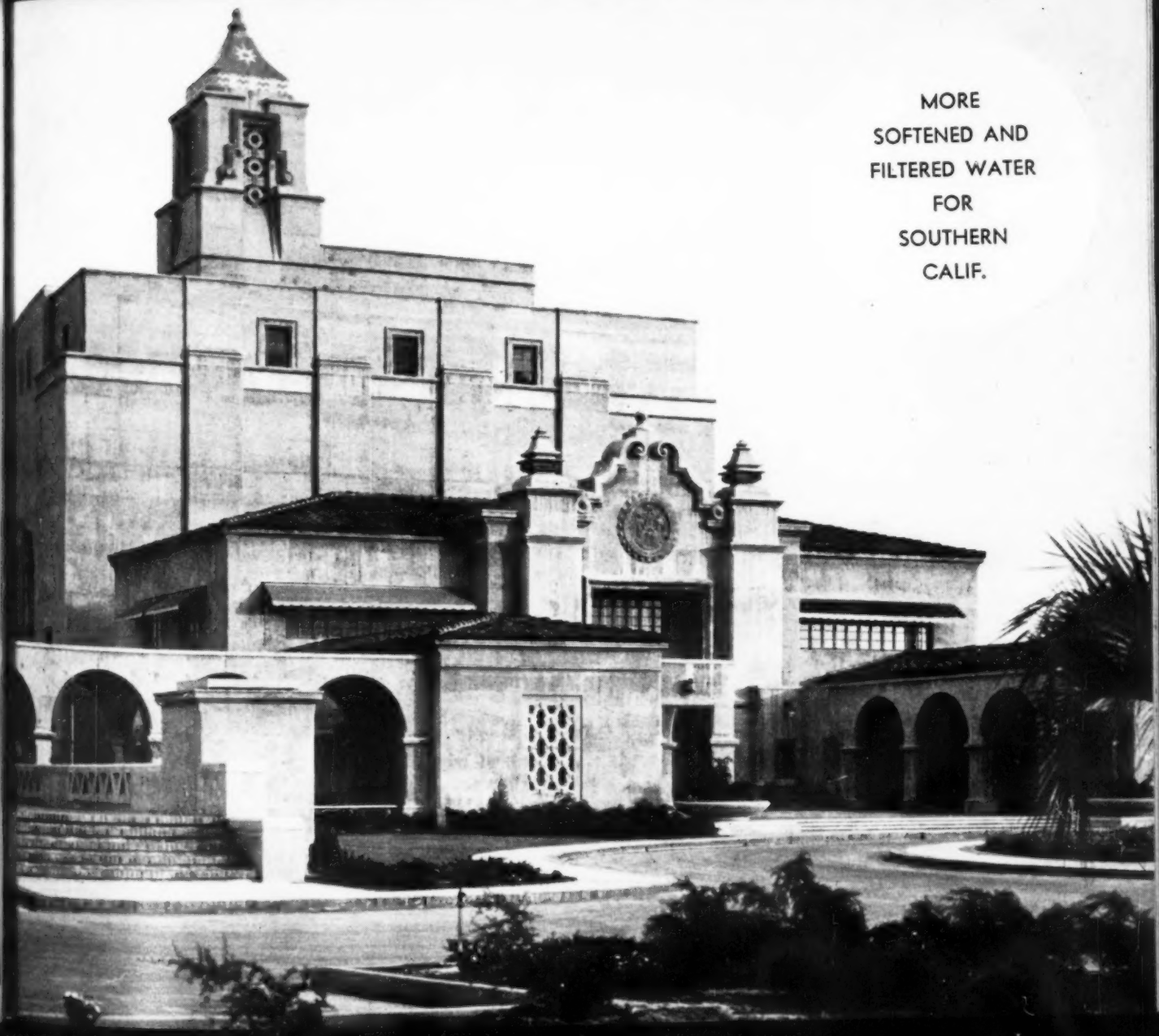
WATER & SEWAGE WORKS



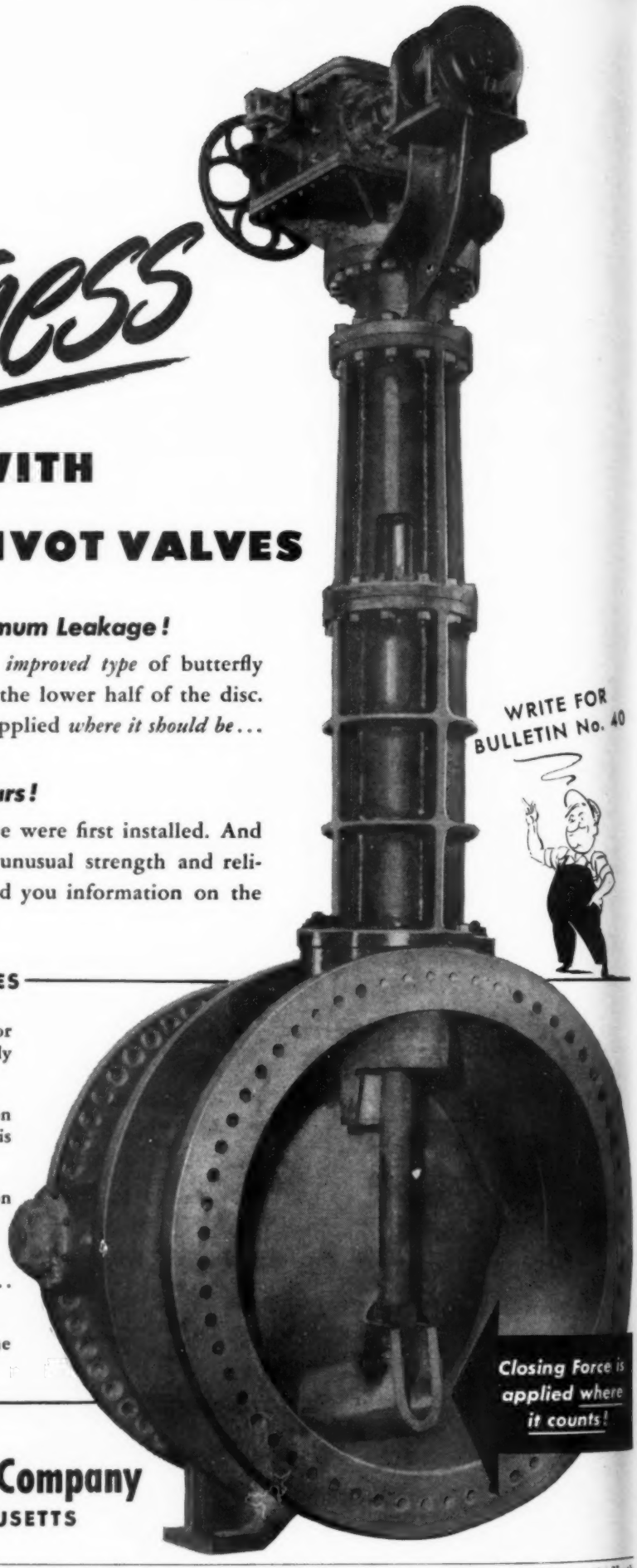
MORE
SOFTENED AND
FILTERED WATER
FOR
SOUTHERN
CALIF.

YOU GET

Tightness

WITH

DOW DISC-ARM PIVOT VALVES



No Deflection of Disc! Minimum Leakage!

This Dow Disc-Arm Pivot Valve is an *improved type* of butterfly valve. It's made so there's no deflection of the lower half of the disc. Minimum leakage. The operating force is applied *where it should be*... at the bottom of the disc.

Tested for 25 Years!

More than 25 years ago, valves of this type were first installed. And they are still going strong... proving the unusual strength and reliability of this design. We'll be glad to send you information on the location of the installations in your area.

—NOTE THESE OTHER ADVANTAGES

Low Head Losses! Head losses are less than for needle or plunger type valves... only slightly higher than gate valves.

No Vibration! Because of direct connection between disc and operating mechanism there is no vibration even at highest velocities.

Speed Closing! Simple and direct operation gives quick closing in emergencies... only one-half the pipe diameter to travel.

Smooth Operation! None of the jerkiness... none of the wear of valves with sliding seats.

Easy Inspection! Disc mechanism is on the downstream side when valve is closed.

The Chapman Valve Mfg. Company

INDIAN ORCHARD, MASSACHUSETTS

WATER AND SEWAGE WORKS. Reg. U. S. Patent Off. December, 1949. Volume 96. Number 12. Published monthly by Gillette Publishing Co., at 404 North Wesley Ave., Mount Morris, Ill. Per copy, 25c; Subscription rate: United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as second class matter March 4, 1948, at the post office at Mount Morris, Illinois, under Act of March 3, 1879.
Executive and business offices, 22 W. Maple St., Chicago 10, Illinois. Editorial office, 155 E. 44th St., New York 17, N. Y.

WHAT TYPE DOMESTIC METER DO YOU NEED? . . .

This

EMPIRE OSCILLATING PISTON METERS

Type 12

Type 14

Made with Empire balanced oscillating piston, famous since 1884 for accuracy and durability. Type 12 meter has bronze case with breakable bottom plate to protect interior parts from frost damage. Type 14 is a bronze bottom plate model for warm climates. Sizes ⅝-in., ¾-in., 1-in.

or This

PITTSBURGH NUTATING DISC METERS

Arctic Type

Tropic Type

The highest quality measuring instruments of this type. Durably constructed to give years of uninterrupted service. Arctic type is protected against damage from freezing by breakable frost bottom. Tropic type has split case, all bronze housing. Sizes ⅝-in., ¾-in., 1-in.

ROCKWELL

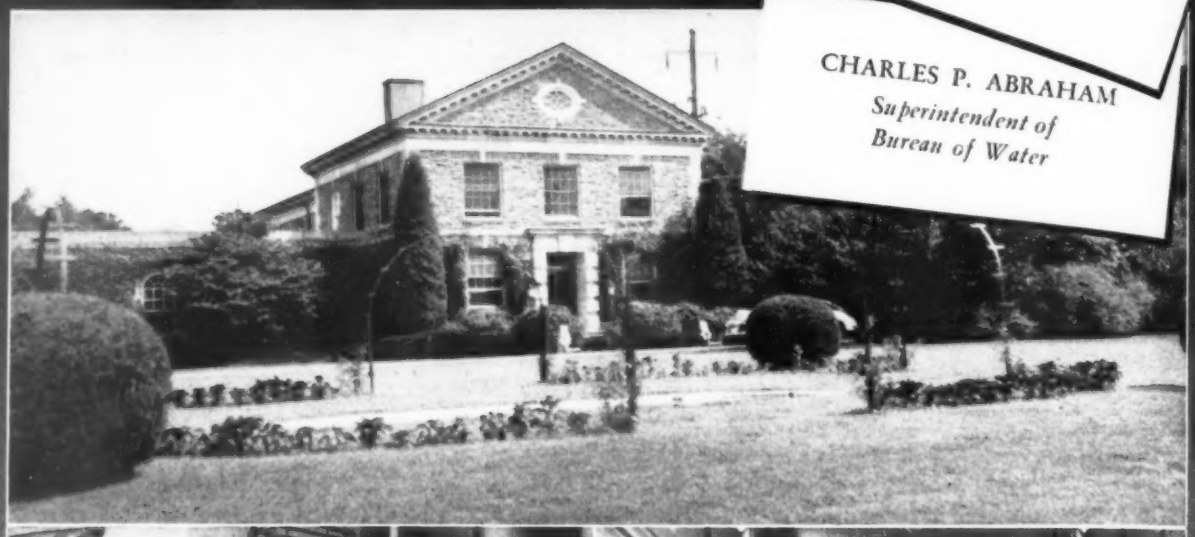
LANCASTER, PA.

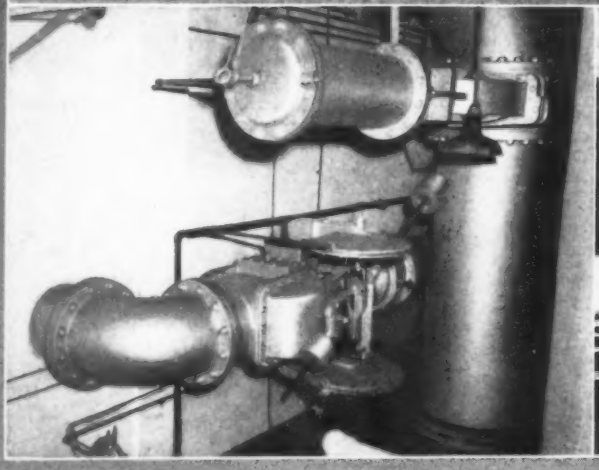
Municipal Filter Plant

(Completed in 1933)

THE CHESTER ENGINEERS
Pittsburgh, Pa.

CHARLES P. ABRAHAM
Superintendent of Bureau of Water





From its beautifully landscaped grounds to its attractive marble and terrazzo filter gallery, this Filter Plant is a credit to Lancaster. Its fine appearance is fully in keeping with the excellence and purity of the treated water it supplies for over 100,000 people. Builders-Providence Venturi Metering and Controlling Equipment, installed by the Pitt Construction Co. and the American Water Softener Co. of Philadelphia, maintains uniform flow rates through the filters for optimum efficiency. Builders filter loss and rate gauges harmonize with the design of the filter gallery and greatly facilitate plant operations. For Bulletins describing Builders waterworks equipment, address Builders-Providence, Inc. (Division of Builders Iron Foundry), Providence 1, R. I.

Builders-Providence equipment furnished for the Lancaster Municipal Filter Plant:

- **1—30"x12" Venturi Tube with Type M Register-Indicator-Recorder, for Low Service Discharge.**
- **1—24"x12¼" Venturi Nozzle with Type M Register-Indicator-Recorder, and Chronoflo Transmitter to operate a Remote Rate Flow Indicator for Low Service Discharge.**
- **1—8"x2¾" Venturi Tube with Type M Register-Indicator-Recorder, for Pressure Line to Filter Plant.**
- **1—30"x15" Venturi Tube with Register - Indicator - Recorder and Chronoflo Transmitter operating 30" Double Dial Wash Water Indicator.**
- **1—36"x12" Venturi Tube with Type M Register-Indicator-Recorder for High Service Suction Line.**
- **1—42"x14" Venturi Tube with Register - Indicator - Recorder for Filtered Water.**
- **8—14"x6" Effluent Rate of Flow Controllers with Master Control and 8 Loss of Head and Rate of Flow Indicating and Recording Gauges.**

BUILDERS PROVIDENCE
Instruments

WATER & SEWAGE WORKS

WATER SUPPLY—SEWAGE DISPOSAL—INDUSTRIAL WASTE TREATMENT

E. S. GILLETTE, Publisher

L. H. ENSLOW, Editor

COMING

Progress in Water Supply & Water Treatment—1949

As customary for sometime, progress and developments in water supply and water treatment during the year will be reviewed in our first issue of the new year—January, 1950. Our readers can expect an outstanding review this year by—

DR. A. P. BLACK*, Head, Dept. of Chemistry, Univ. of Florida, Gainesville, Fla.
*President, Am. Water Works Assn.

Progress in Sewage & Industrial Wastes Treatment—1949

As in past years progress and developments in sewage and industrial wastes treatment will be featured in our February, 1950, issue. As this year's reviewer, we have been fortunate in securing the highly qualified—

ARTHUR H. NILES*, Sup't., Sewage Works, Toledo, Ohio.
*President, Federation of Sewage Works Assns.

The B.O.D. Test—a Critical Examination

Constitutes a report on the chief shortcomings of the Standard 5 Day B.O.D. Test with warnings to users of the test when applied to sewages as well as trade wastes. Considering the number of potential vitiating influences the investigator offers a number of warnings to those who may not adequately appreciate the deficiencies of the B.O.D. test or the value of the C.O.D. (chemical oxygen demand) test in combination with the biologic demand test. This critical analysis comes from—

ROBERT S. INGOLS, Research Prof., Ga. Institute of Technology, Atlanta, Ga.

Corrosion and Its Mitigation

Is the subject of an interesting and enlightening report by the Committee on Corrosion of the New England Water Wks. Assn. which should prove of considerable value to the readers of *Water & Sewage Works;* and is, therefore, being printed by permission in an early issue as well as in our 1950 Reference and Data Number—May, 1950.

Treating Wool-Scouring Wastes

Is the story of the treatment of wool-scouring wastes and other wastes from a modern carpet mill in Virginia. This article, long delayed, unfortunately, describes the treatment plant, method of treatment and results secured. The plant is that recently constructed by the James Lees & Sons Co. at Glasgow, Va. The author is—

STUART E. COBURN, Chem. Eng'r. Metcalf & Eddy Engrs., Boston, Mass.

A "Sewabazooka"

If you are curious, watch for the illustrated description of the "Sewabazooka" by—

J. R. JACOBS, Supt., Water and Sewage Works, Moultrie, Ga.

Sewer Maintenance & Operation

Practices in sewer maintenance and operation in Los Angeles will be set forth in a series of short pithy articles by—

REUBEN F. BROWN, Supt., Sewer Maint. & Operation, Los Angeles, Calif.

Operation of Small Water Plants

Is the general title of a new series of articles by the same author whose series on the "Operation of Small Filtration Plants" we published during the past year. The author is—

A. E. CLARK, Gen'l Mgr., Nashville (Tenn.) Suburban Utility Dist.

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(Member—Audit Bureau of Circulation and Associated Business Papers.)

(1) This 101-year-old cast iron water main is serving Frederick, Maryland.

(2) Still in use after 118 years of service in the water supply system of St. Louis, Mo.

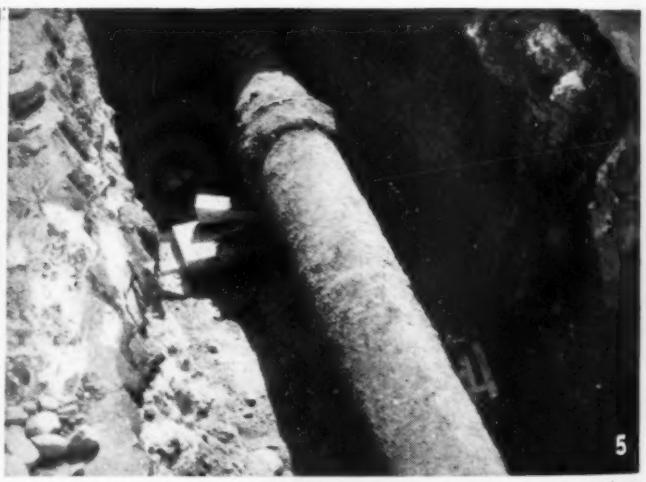
(3) This water main, installed 117 years ago, is still serving Richmond, Va.

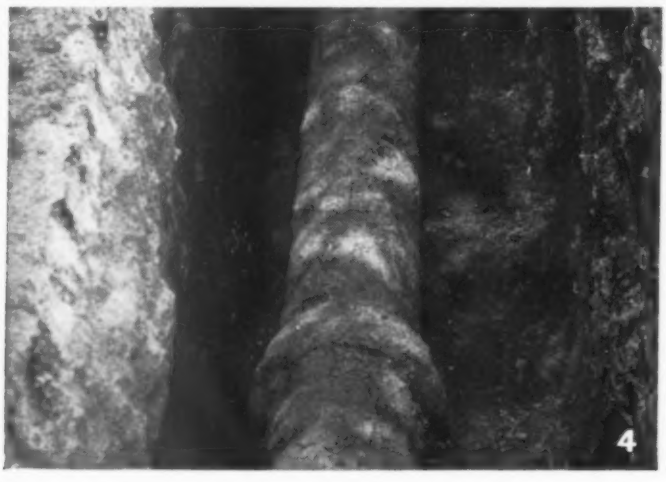
(4) Lancaster, Pa. laid this cast iron water main 105 years ago. It is still serving.

(5) One of several cast iron water mains that have been serving New York City for more than a century.

(6) America's oldest cast iron water main, now in its 132nd year of service in Philadelphia.

(7) This cast iron water main has been serving Boston for 120 years.



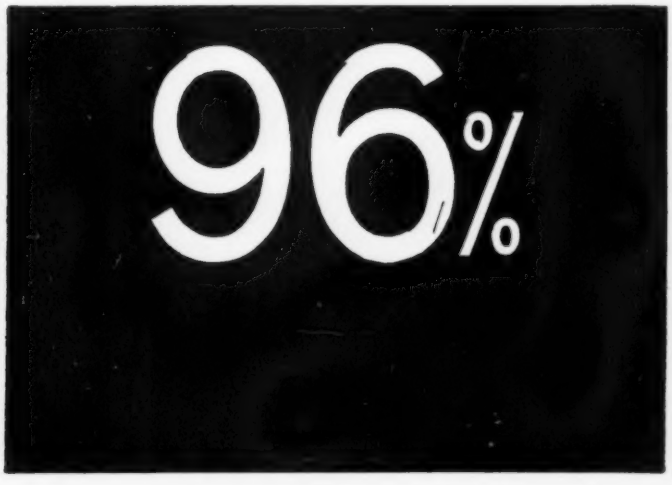


Going strong in their 2nd Century

About 30 of the older American cities have cast iron water or gas mains in service which were laid from 100 to 132 years ago. Most of these mains, on or after their 100th Anniversary, have been uncovered, inspected and photographed for the record. Seven of them—all water mains, are shown in this advertisement.

While it is well known that cast iron water mains in England, France and Germany have service records that approach three centuries, we, who make cast iron pipe, nevertheless get a thrill out of looking down into the trench at an uncovered section of a main that has been in service for 100 years—and so, we are told, do water works and gas engineers.

When one considers the radical changes which have occurred in a century in vehicular traffic, and the vast development of underground construction for the many utility services, the fact that these mains are now in their second century of service is all the more remarkable.



CAST IRON PIPE

SERVES FOR CENTURIES

Cast Iron Pipe Research Assn., T. F. Wolfe, Engr., Peoples Gas Bldg., Chicago 3.

SPOKANE..

The Same Kind of Reliable Allis-Chalmers Equipment Serving Spokane Is Available to Any Size City—Large, Medium or Small

VITAL to any city's industrial and residential growth is a *dependable source of good water.* Spokane has grown from a small village to a key city of 167,000 largely aided by an abundant supply of water drawn from wells . . . clear water with a hardness of but 8 grains per gallon, and a cool temperature of 48F.

To pump this water efficiently and economically takes dependably-designed equipment — much of it carrying the trademark, ALLIS-CHALMERS. In Spokane's waterworks you will find A-C hydraulic turbines (which supply power for pumping) and generators, switchgear, motors and centrifugal pumps.

A-C READY TO DISCUSS *YOUR* EQUIPMENT NEEDS

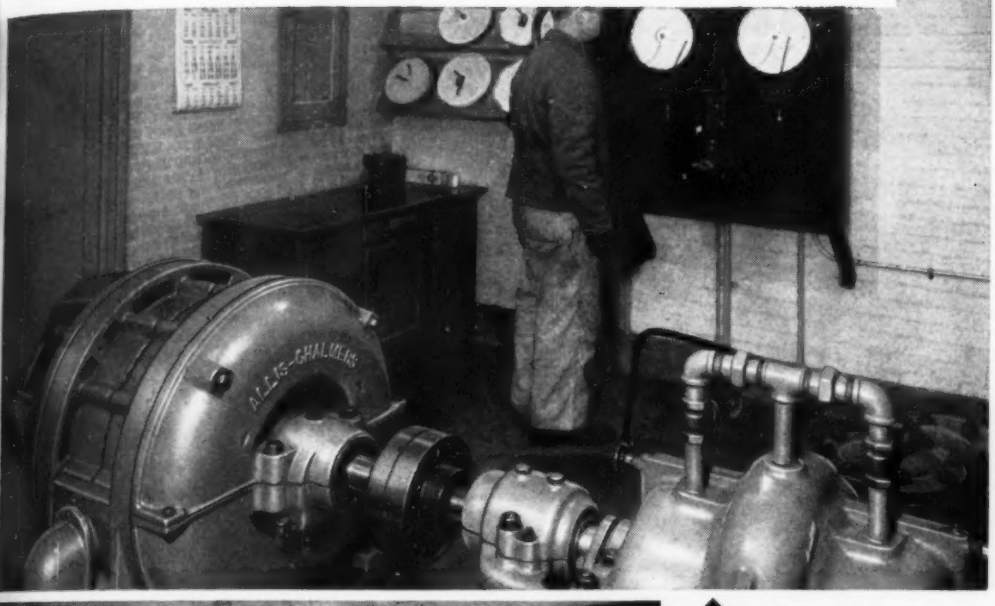
As builders of the world's widest range of correlated ma public works equipment, Allis-Chalmers is in the uniq position of being able to offer you a high degree of *eng neering coordination* in the selection and "teaming" o equipment for municipal operation. This *simplifies* yo engineering, *pins down responsibility* for performance. A qualified engineer will be glad to go into detail with you. Call your A-C Sales Office or write direct.

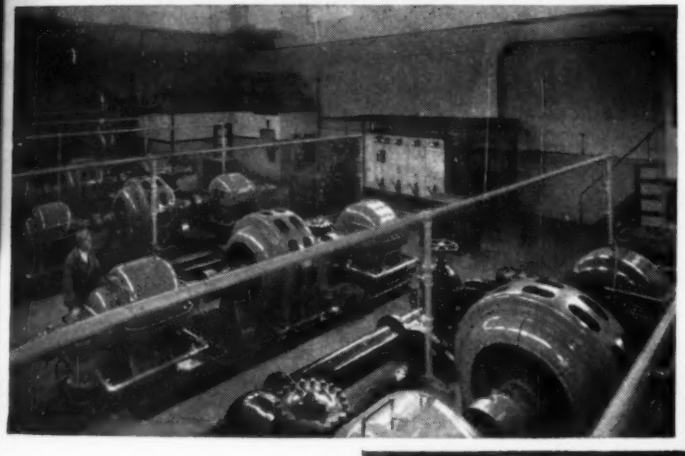
ALLIS-CHALMERS, 1192A SO. 70 ST.
MILWAUKEE, WIS.

Builders of the World's Widest Range of Public Works Equipment

ALLIS

A Story of Progress

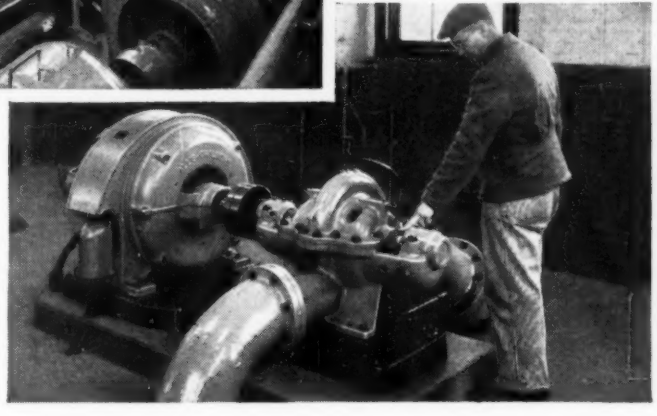




GRAND STREET pumping station equipped with Allis-Chalmers pump and motor. The 10 x 8 inch pump delivers 2,780 gpm against a 200 ft head and is driven by a 200 hp motor.

RIVER STATION pumping plant has depended on four Allis-Chalmers pumps and motors since 1911. Each unit rated 8,333 gpm, heads to 260 ft. Motors rated 900 hp, 2300 volts, 900 rpm.

ALLIS-CHALMERS pump-motor "team" delivers 2,700 gpm against a head of 210 ft. The 200 hp, drip-proof motor has been in service many years. Location of this pumping station is adjacent to the Lincoln Heights reservoir, the city's largest, which has a capacity of 24 million gallons.



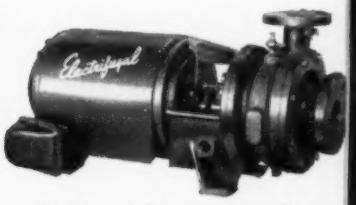
Electrifugal is an Allis-Chalmers trademark.

CHALMERS

News Notes

FOR WATERWORKS MEN

HERE'S a problem common to many cities these days: outlying residential areas expand so fast that water lines become inadequate. A city in the Southwest, for example, was serving up to 50 homes on a two-inch line and water pressures were woefully weak. Faced with heavy construction costs in replacing this line with a larger one, they decided



Electrifugal Pumps—range from 10 to 1600 gpm, heads up to 525 ft.

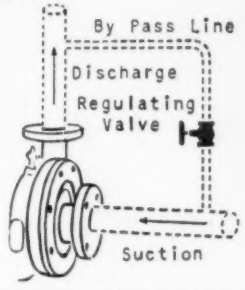
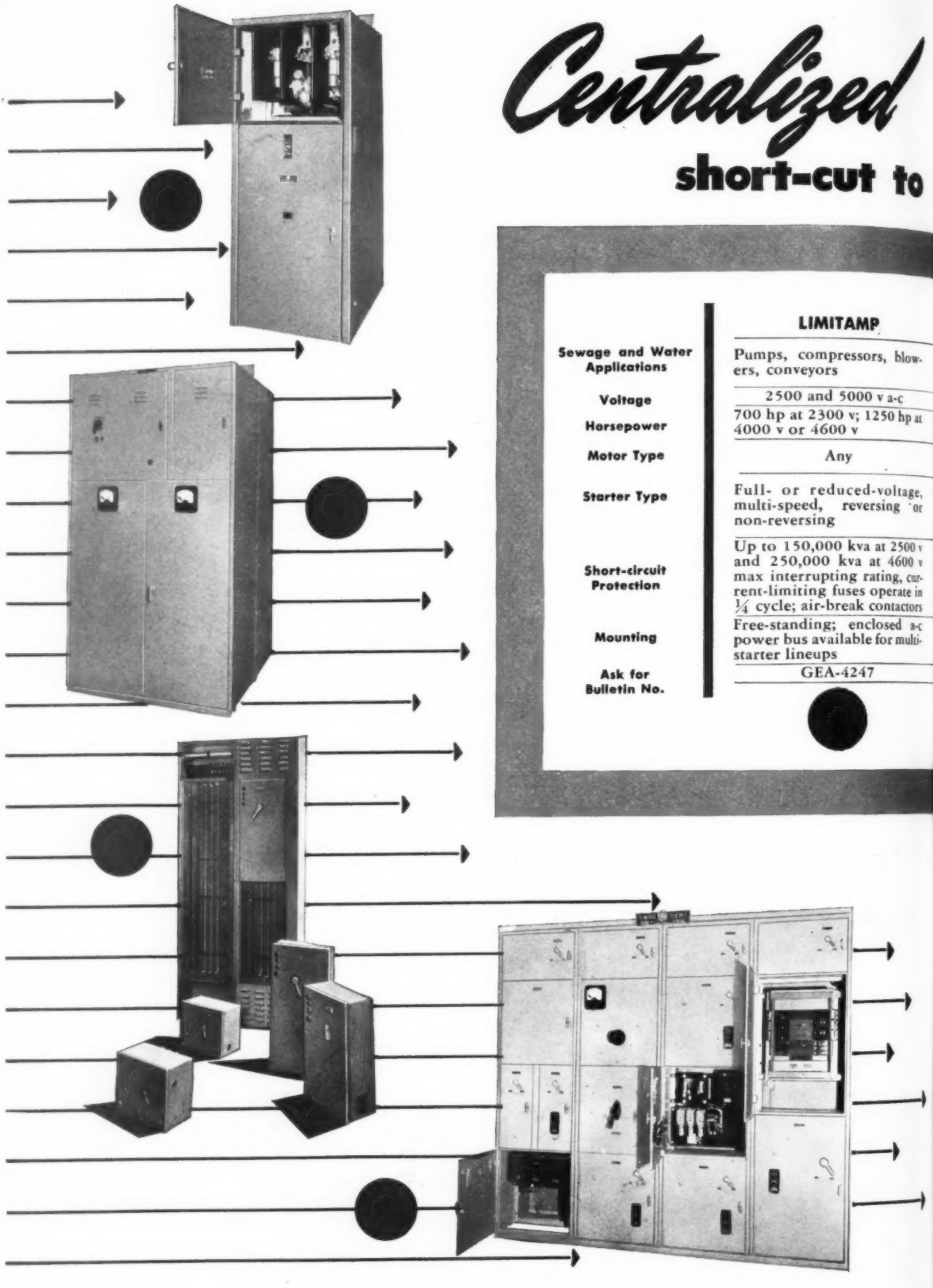


Diagram showing arrangement of by-pass line.

to try an *Electrifugal* pump as a booster. With this arrangement a by-pass line is generally attached to prevent overheating of the pump during low-consumption periods.

Electrifugal pumping units with motor and pump on a single shaft, are ideal booster pumps for situations like this. Why not check up on what *Electrifugal* pumps can do for your city? Write today. A-286

A-C ALLIS-CHALMERS



Centralized

short-cut to

	LIMITAMP
Sewage and Water Applications	Pumps, compressors, blowers, conveyors
Voltage	2500 and 5000 v a-c
Horsepower	700 hp at 2300 v; 1250 hp at 4000 v or 4600 v
Motor Type	Any
Starter Type	Full- or reduced-voltage, multi-speed, reversing or non-reversing
Short-circuit Protection	Up to 150,000 kva at 2500 v and 250,000 kva at 4600 v max interrupting rating, current-limiting fuses operate in ¼ cycle; air-break contactors
Mounting	Free-standing; enclosed a-c power bus available for multi-starter lineups
Ask for Bulletin No.	GEA-4247

"Packaged" Control

efficient, attractive plant layout

HEAVY-DUTY LOW-VOLTAGE CONTROLLERS	MOTOR CONTROL CENTERS	CABINETROL
Pumps, compressors, blowers, conveyors	Pumps, compressors, blowers, conveyors, auxiliary equipment, lighting circuits	Complete plant-group control including power-company metering, other meters
600 v a-c, 230 v d-c max	220 to 600 v a-c	220 to 600 v a-c
350 hp d-c, 800 hp a-c max	Up to 100 hp at 440 v	Up to 400 hp at 440 v; or 200 hp at 220 v
Any	Squirrel-cage induction; multi-speed	Any
Full- or reduced-voltage, multi-speed reversing or non-reversing	Combination starters, full-voltage or reactor reduced-voltage, reversing, non-reversing or two-speed	All kinds, including magnetic and electronic
Up to 25,000 or 50,000 amp short-circuit interrupting rating, starters with draw-out air circuit breakers	Up to 25,000 amp interrupting rating; combination starters with air circuit breakers in isolated compartments	Up to 50,000 amp interrupting rating; combination starters with air circuit breakers or fused switches in isolated compartments
Free-standing; enclosed a-c power bus available for multi-starter lineups	Wired or unwired, accessible from front	Free-standing, completely wired, accessible front and rear
GEA-4939	GEA-4979	GEA-3856A

One Of The Above General Electric packaged control equipments can be tailored from standard parts to fill any sewage- or water-plant need. Each is completely metal-enclosed, factory-assembled and tested, and shipped ready to install. To save you installation time and expense, all bus connections, panel wiring, and interconnections can be made at the factory . . . just set the unit in place and hook up incoming and outgoing leads.

All the above equipments are a standard height to present a uniform, attractive appearance when installed together. Metal enclosures provide greater safety to personnel and equipment.

PLAN EARLY AND PROFIT!

Your consulting engineer or General Electric representative will tell you more about these equipments and help you plan your entire electrical layout. Consult him early, so that you can profit by co-ordinated planning . . . thereby simplifying engineering, buying, construction and installation. Apparatus Dept., General Electric Co., Schenectady, N. Y.

With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

GENERAL ELECTRIC

Engineering Facts about

Johns-Manville TRANSITE* PRESSURE PIPE

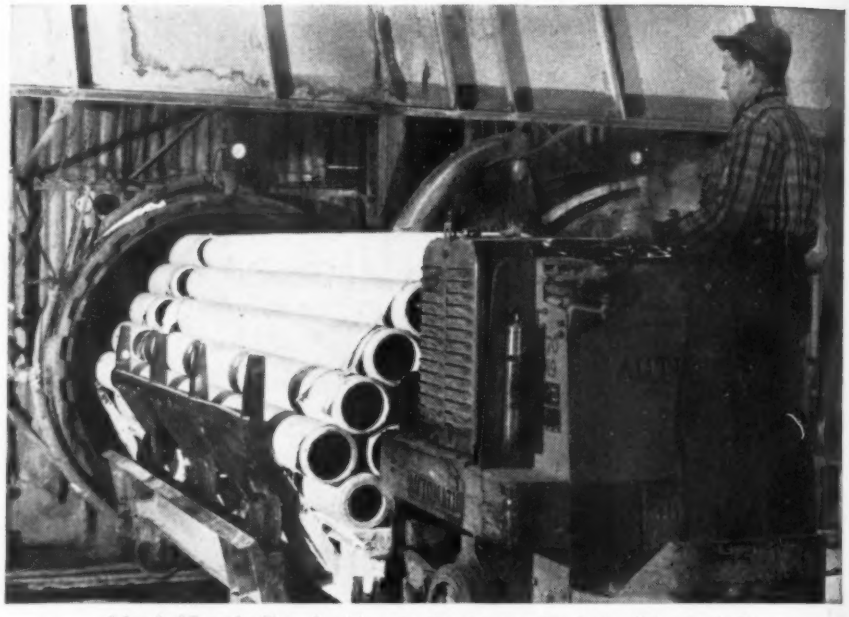
Resistance to Corrosion ... an index of long life

Ability to withstand corrosion is the most important single measure of the durability or life expectancy of an underground water pipe material. Two factors—both inherent in the pipe itself—contribute to Transite's exceptional ability to resist corrosion. These are:

1. The inherently corrosion-resistant materials of which Transite is made.

2. The specially developed manufacturing process — employed exclusively by Johns-Manville—which imparts a high degree of chemical stability to the finished product.

In the manufacture of Transite Pipe, the three basic ingredients, asbestos fibres, cement and silica



A load of Transite Pipe about to enter the steam curing tanks. This step in the Johns-Manville manufacturing process contributes substantially to the corrosion resistance of the finished pipe—and, therefore, to its long service life.

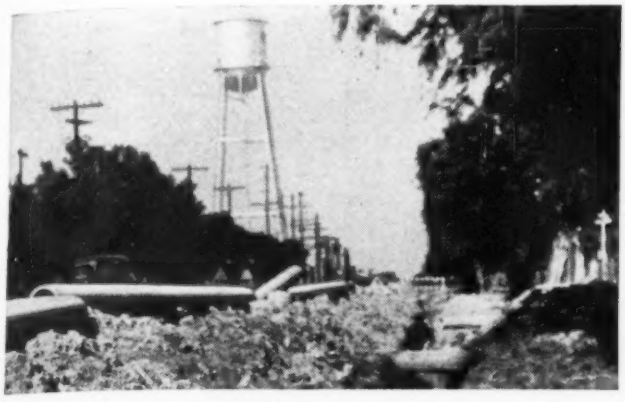
Transite Pipe was first used by this large west coast city in 1933. Its exceptional corrosion resistance—an index of long life—has already made it possible for Transite to outlive other pipe several times over.

—all basically corrosion-resistant by nature—are consolidated under tremendous pressure to form a pipe wall of dense, uniform, homogeneous structure. After forming, the pipe is subjected to a special steam curing process.

It is in this steam curing stage that so much is contributed to the stability and structural integrity of the pipe. Here under the action of pressure steam, Transite assumes a new chemical identity. The silica unites chemically with the free lime ordinarily associated with cement products and converts it into highly stable calcium silicates. As a result of this process, the cured pipe is unusually resistant to corrosive attack throughout its entire structure.

*Transite is Johns-Manville's registered trade mark for its asbestos-cement pipe and other products.

This intrinsic resistance to corrosion has been substantiated by numerous Transite installations. Some of these have been exposed to highly aggressive soils, both alkaline and acid, for many years. Many are now serving as replacements under conditions so destructive that the useful life of the pipe materials previously used had been seriously curtailed.



Transite Pipe was installed in this Texas city ten years ago to replace another pipe material that had been destroyed by soil corrosion in 7 years. The Transite mains are still on the job today with a long useful life ahead of them.

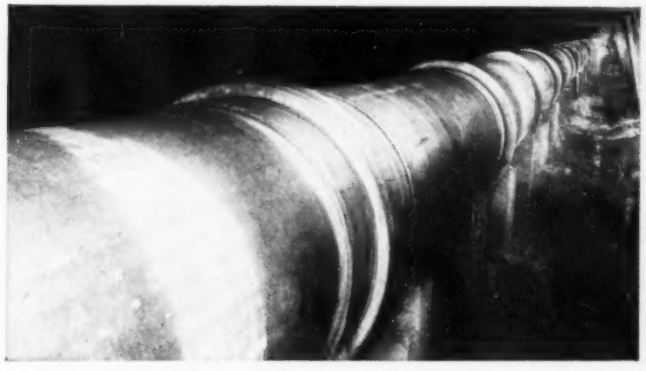
In one such installation, a Transite main installed during 1932 in an extremely corrosive soil was recently made the subject of careful study to determine its condition. Sections of the pipe, including couplings, were dug up and shipped to the factory for test. There was no evidence of deterioration. Pipe and couplings readily withstood the original factory pressure test, equivalent to four times the normal working pressure of the line.

Like thousands of other communities, this West Virginia city selected Transite Pipe because it promised assurance of maximum life. Today, after 14 years of service, the first installation of Transite has already fulfilled this promise by outlasting the pipe material previously used.

Certain types of industrial service provide an even more severe "proving ground" for the life expectancy of pipe materials, and here, too, Transite Pipe has demonstrated exceptional corrosion resistance. Coal mine service is a typical example. Here acid mine waters are frequently so corrosive that they have destroyed ordinary pipe materials in a matter of a few months or years. Yet Transite Pipe has handled these same waters under working pressure up to 150 lbs. for periods from 10 to 15 years with little, if any, indication of deterioration.

Corrosive soil conditions were so severe at this location in a prominent New England city that the life of the pipe material formerly used was only 15 years. Transite Pipe, put in as a replacement in 1934, continues to give the same efficient, dependable service as the day it was installed.

To evaluate the ability of pipe materials to withstand soil corrosion, the National Bureau of Standards has conducted an extensive series of field tests. These studies are based on examination of hundreds of pipe samples periodically removed from severely corrosive soils. In these and similar tests, Transite Pipe has consistently demonstrated its superior resistance to soil corrosion, confirming the long life expectancy which this asbestos-cement pipe has evidenced in thousands of water works installations.



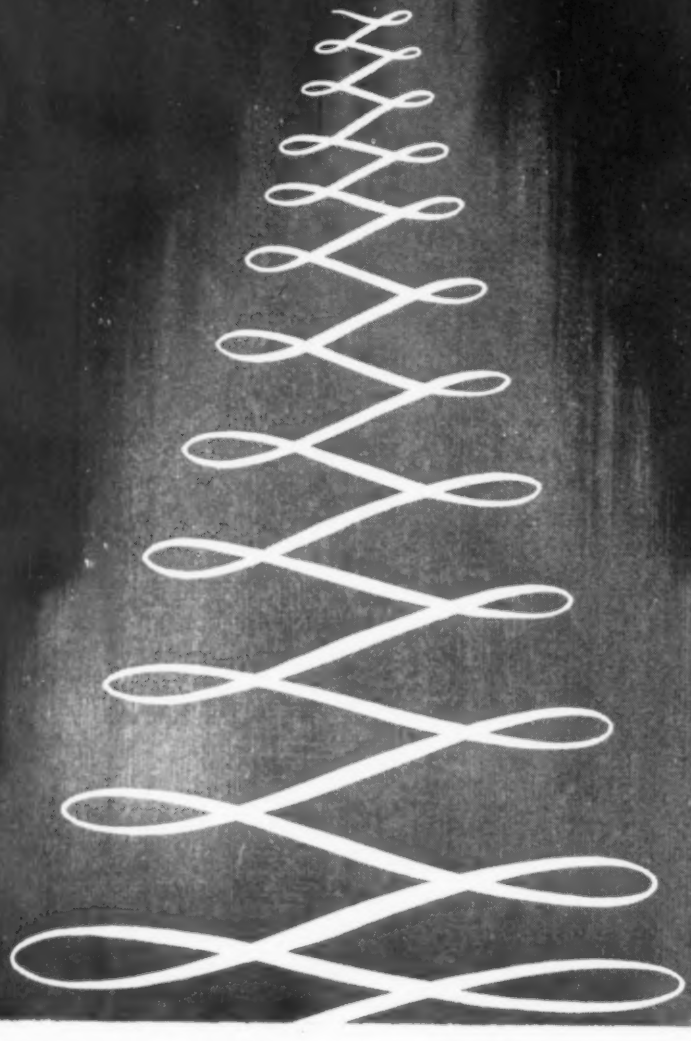
Transite's ability to provide long-term, dependable service is well illustrated by its performance in coal mines, where it consistently outlasts other pipe materials in carrying corrosive mine drainage waters. The 36" Transite line shown above has been conveying acid mine waters for 15 years.

For further details about Transite Pressure Pipe, write Johns-Manville, Box 290, New York 16, N. Y.

For further details about Transite Pressure Pipe write Johns-Manville, Box 290, New York 16, N. Y.

JOHNS-MANVILLE JM PRODUCTS

GREETINGS OF THE SEASON



With Best Wishes for a Prosperous New Year to Old and New Friends

This is the time of year we like to sit back and think of our friends . . . our customers . . . as we record 1949 as one of the most outstanding years in the history of James B. Clow & Sons. For it has been *your* confidence, *your* fidelity, beyond estimate, that have made this possible. With faith in the future we again join hands to make 1950 an even greater year for all of us. With all best wishes to you from the employees of

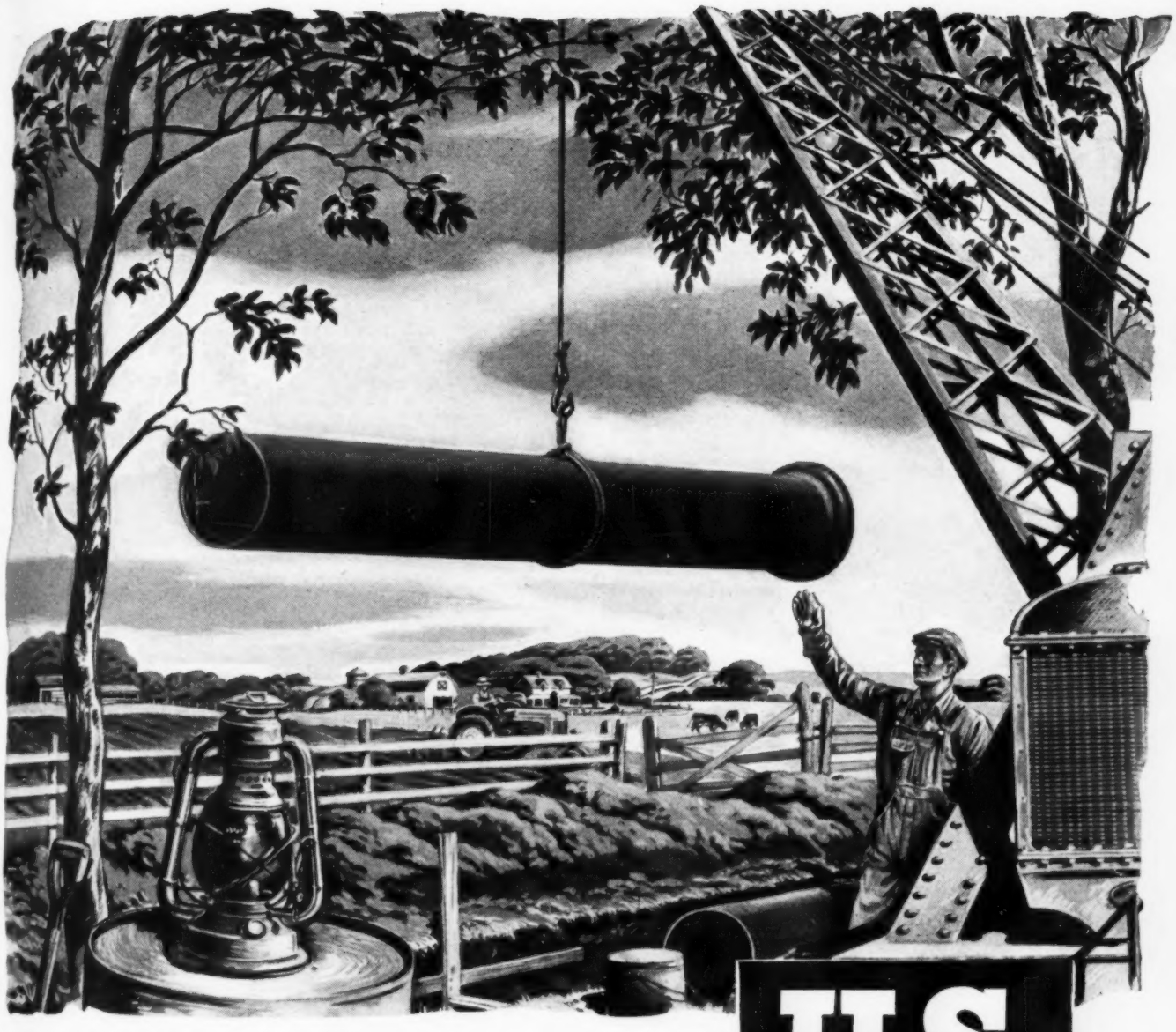
JAMES B. CLOW & SONS, Chicago

EDDY VALVE COMPANY SUBSIDIARY

NATIONAL CAST IRON PIPE DIVISION

IOWA VALVE COMPANY SUBSIDIARY

Manufacturers of cast iron pipe, fittings and specials; valves and fire hydrants; Clow Gasteam radiators and Gas-fired unit heaters.



Painted for U. S. Pipe & Foundry Co. by Paul Laune

U.S. PIPE

WE SAY farewell this month to the first half of the 20th Century as well as to our 50th Anniversary year. In 1899, when United States Pipe & Foundry Co. was organized, we produced all pipe by the pit-cast process, which is still used by us mainly for making large diameters. In 1922, we shipped the first length of cast iron pipe "centrifugally cast in a metal mold," commercially produced in the United States. Today, the large majority of our pipe is produced by this progressively-improved process, which we regard as our Company's greatest contribution to efficiency and economy in pipe line service. **United States Pipe and Foundry Co., General Offices: Burlington, New Jersey, Plants and Sales Offices Throughout U. S. A.**

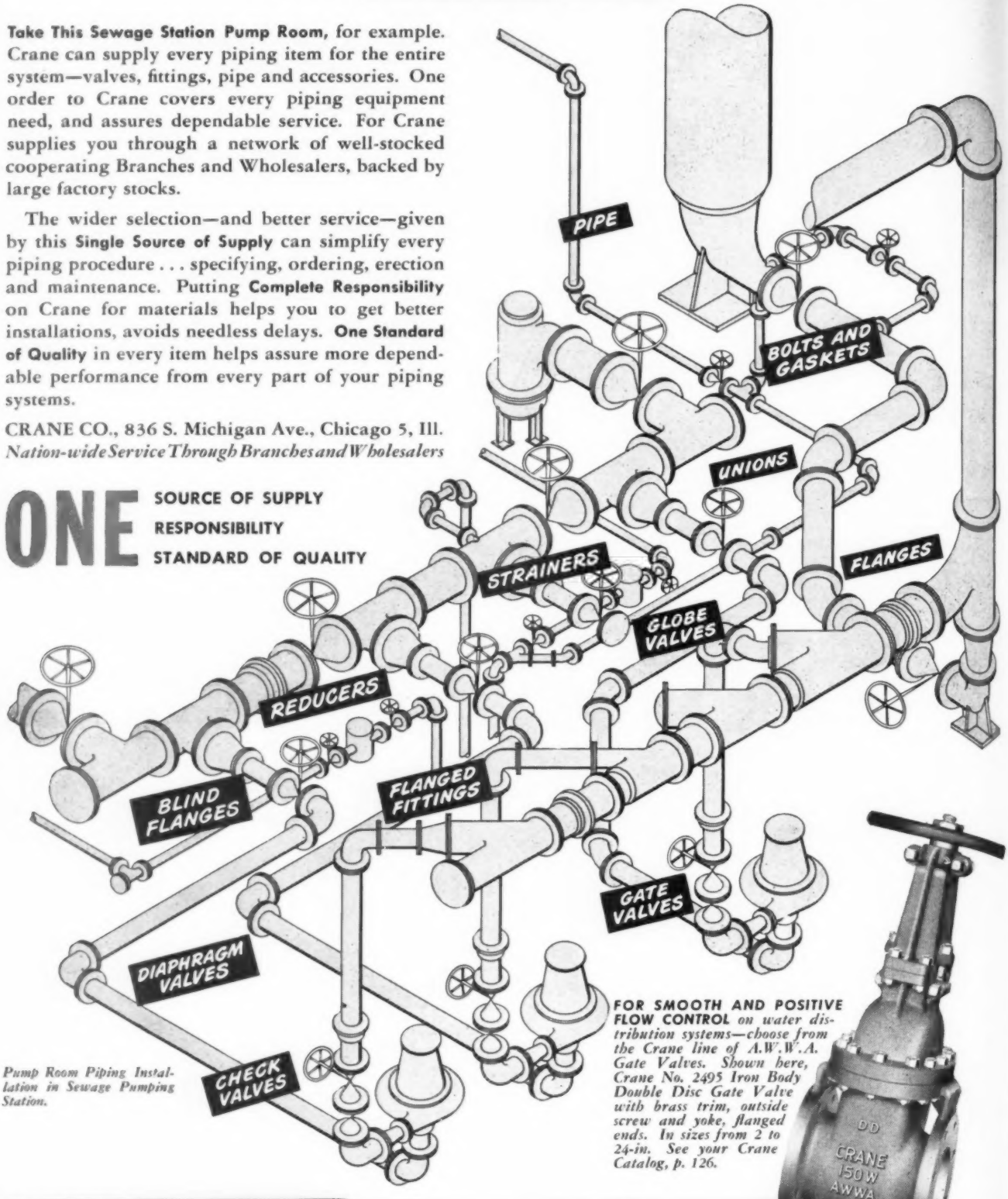
Everything in piping for pumping systems from one complete line . . . CRANE

Take This Sewage Station Pump Room, for example. Crane can supply every piping item for the entire system—valves, fittings, pipe and accessories. One order to Crane covers every piping equipment need, and assures dependable service. For Crane supplies you through a network of well-stocked cooperating Branches and Wholesalers, backed by large factory stocks.

The wider selection—and better service—given by this **Single Source of Supply** can simplify every piping procedure . . . specifying, ordering, erection and maintenance. Putting **Complete Responsibility** on Crane for materials helps you to get better installations, avoids needless delays. **One Standard of Quality** in every item helps assure more dependable performance from every part of your piping systems.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Nation-wide Service Through Branches and Wholesalers

ONE SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY



Pump Room Piping Installation in Sewage Pumping Station.

FOR SMOOTH AND POSITIVE FLOW CONTROL *on water distribution systems—choose from the Crane line of A.W.W.A. Gate Valves. Shown here, Crane No. 2495 Iron Body Double Disc Gate Valve with brass trim, outside screw and yoke, flanged ends. In sizes from 2 to 24-in. See your Crane Catalog, p. 126.*

EVERYTHING FROM . . .

VALVES • FITTINGS
PIPE • PLUMBING
AND HEATING

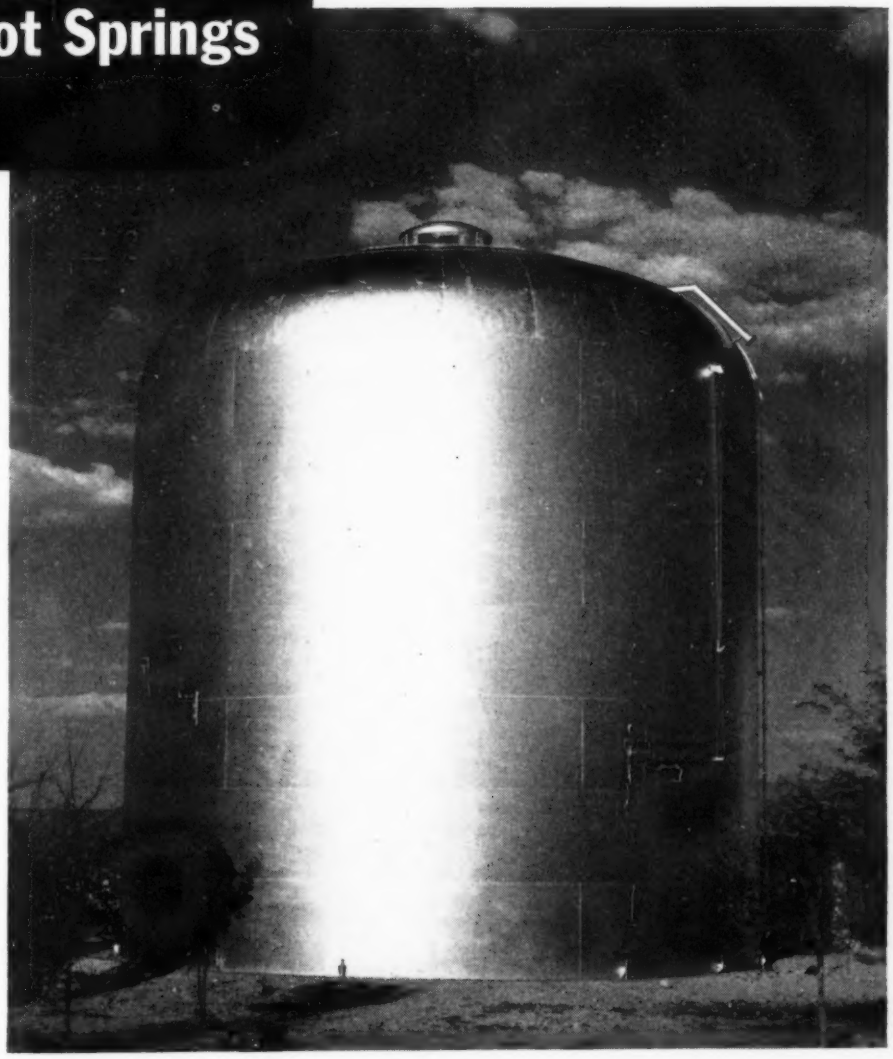
CRANE

FOR EVERY PIPING SYSTEM

Horton

Welded-Steel Water Reservoir at Hot Springs

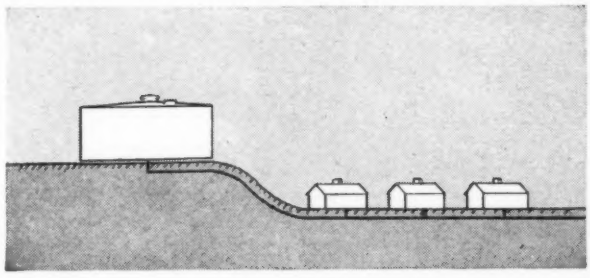
provides gravity water pressure



Horton reservoirs offer an economical method of improving the water pressure in a city's distribution system under certain conditions. When a location on high ground is available, reservoirs give results comparable to those provided by elevated tanks—more uniform water pressure in all parts of the distribution system, at all times of the day; less work for pumping equipment during peak demand periods; savings in pumping station power costs; and lower fire insurance premiums.

The 1,000,000-gal. Horton reservoir at Hot Springs, New Mexico, is located on a hill in the center of the city. From this location it is able to serve about three-quarters of the city's area. The attractive lines of the reservoir, and its simple maintenance requirements, are the result of butt-welded steel construction throughout.

The diagrammatic view at the right shows how a steel reservoir can be used to provide gravity water pressure where a natural elevation is available. Ask our nearest office to give you estimating figures on reservoirs and elevated tanks when contemplating improvements in your water system.

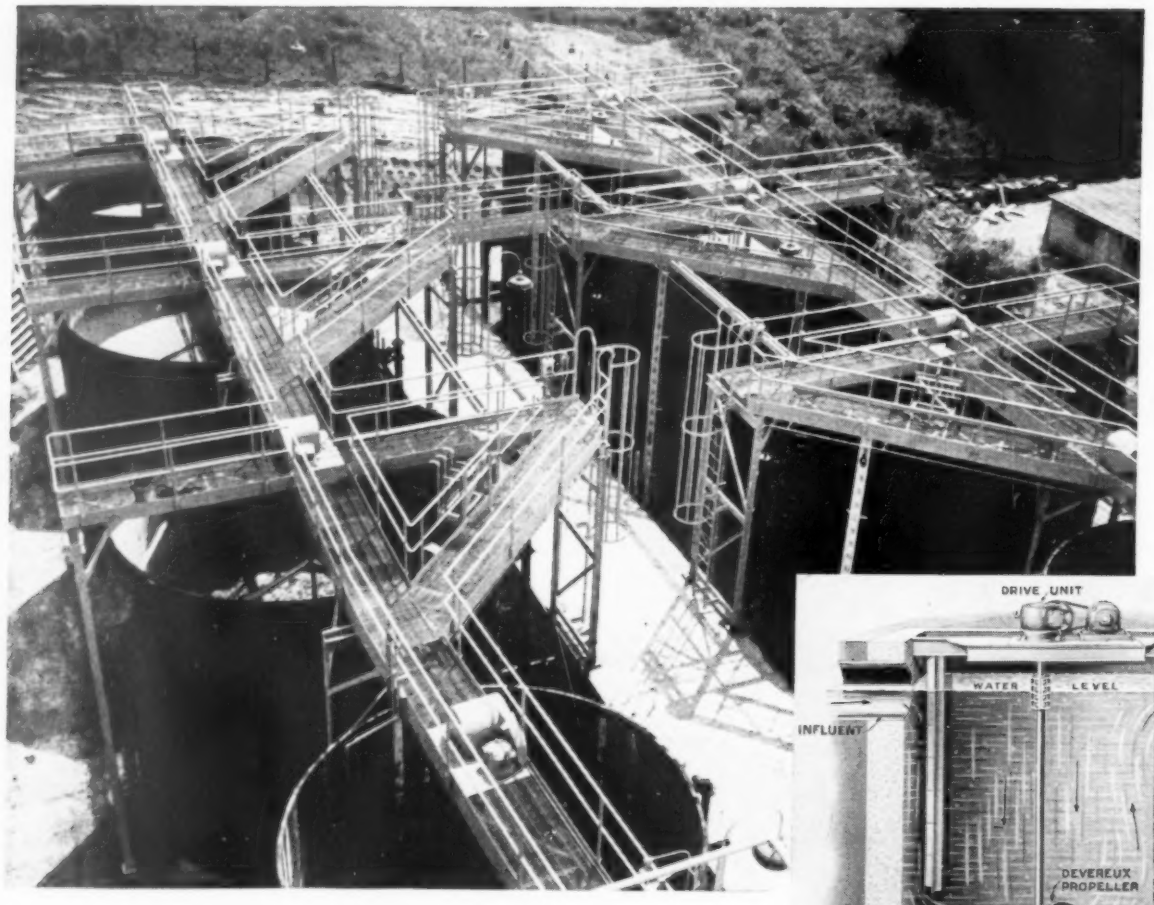


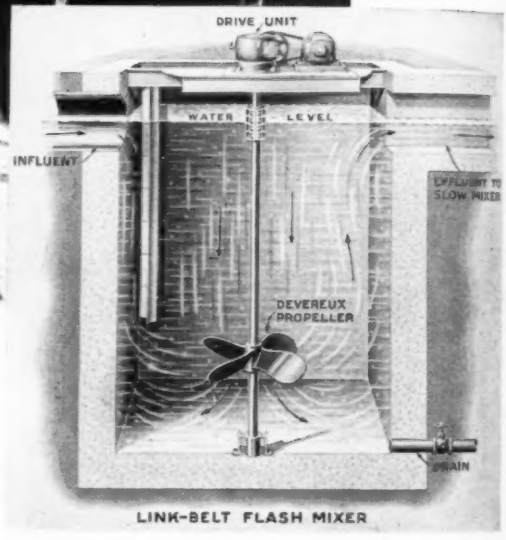
CHICAGO BRIDGE & IRON COMPANY

Atlanta 3	2181 Healey Building	Detroit 26	1551 Lafayette Building	Philadelphia 3	1644—1700 Walnut Street Building
Birmingham 1	1586 North Fiftieth Street	Houston 2	2115 National Standard Building	Salt Lake City 1	1550 First Security Bank Building
Boston 10	1048—201 Devonshire Street	Havana	402 Abreu Building	San Francisco 11	1283—22 Battery Street Building
Chicago 4	2198 McCormick Building	Los Angeles 14	1555 General Petroleum Building	Seattle 1	1350 Henry Building
Cleveland 15	2262 Guildhall Building	New York 6	3390—165 Broadway Building	Tulsa 3	1646 Hunt Building

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

Toxic Waste Water Made Harmless





LINK-BELT FLASH MIXER

With LINK-BELT Equipment→

Efficient Flash Mixers and Thickener Remove Metals and Cyanides

Elaborate metal working operations at the Meadville, Pa., plant of Talon, Inc., produce an average of 90,000 gallons of waste water daily, which must be treated to remove toxic elements, prior to discharge into nearby French Creek. Link-Belt equipment developed through broad experience in industrial and sewage treatment plants of every kind, provide thorough mixing of treatment chemicals, and removal of sludge, producing a crystal clear effluent.

Six Link-Belt Flash mixers, with 48 in. diameter, stainless steel propellers operating in wooden tanks, treat the acid pickling wastes; two similar units treat the cyanide wastes. Sludge from these tanks accumulates in a thickening tank, and is slowly agitated by a Link-Belt Thickener unit. This process reduces the volume of the sludge to be hauled away by 50%, affecting a corresponding saving in haulage costs. 11,637

Link-Belt experience in the design of equipment for the treatment of water, sewage and industrial liquids is the broadest, and equipment developed by Link-Belt engineers comprises most every item required for complete results. Link-Belt engineers welcome your inquiries.

●

Efficient power transmission machinery required to operate sewage and water treatment systems is included in the complete Link-Belt line.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY

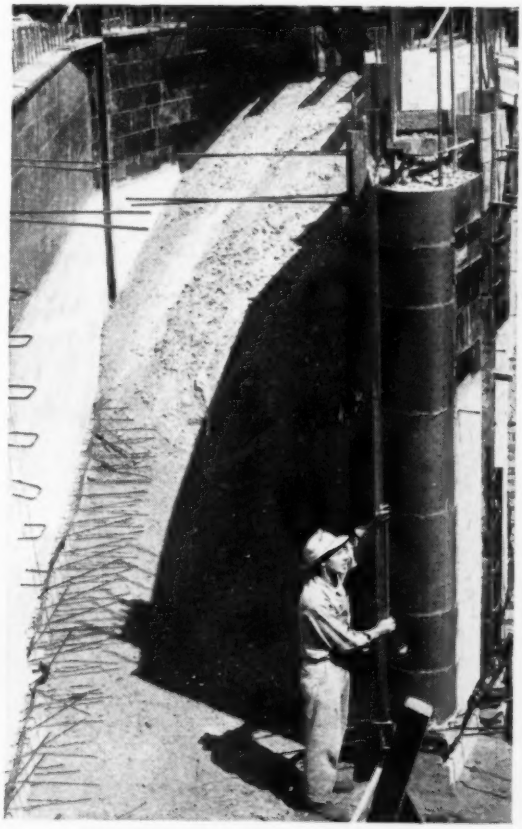
Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

Vitrified CLAY PIPE AND CLAY LINER PLATES

PREVENT CORROSION AND DISINTEGRATION IN NEW 46 MILLION DOLLAR DISPOSAL PLANT

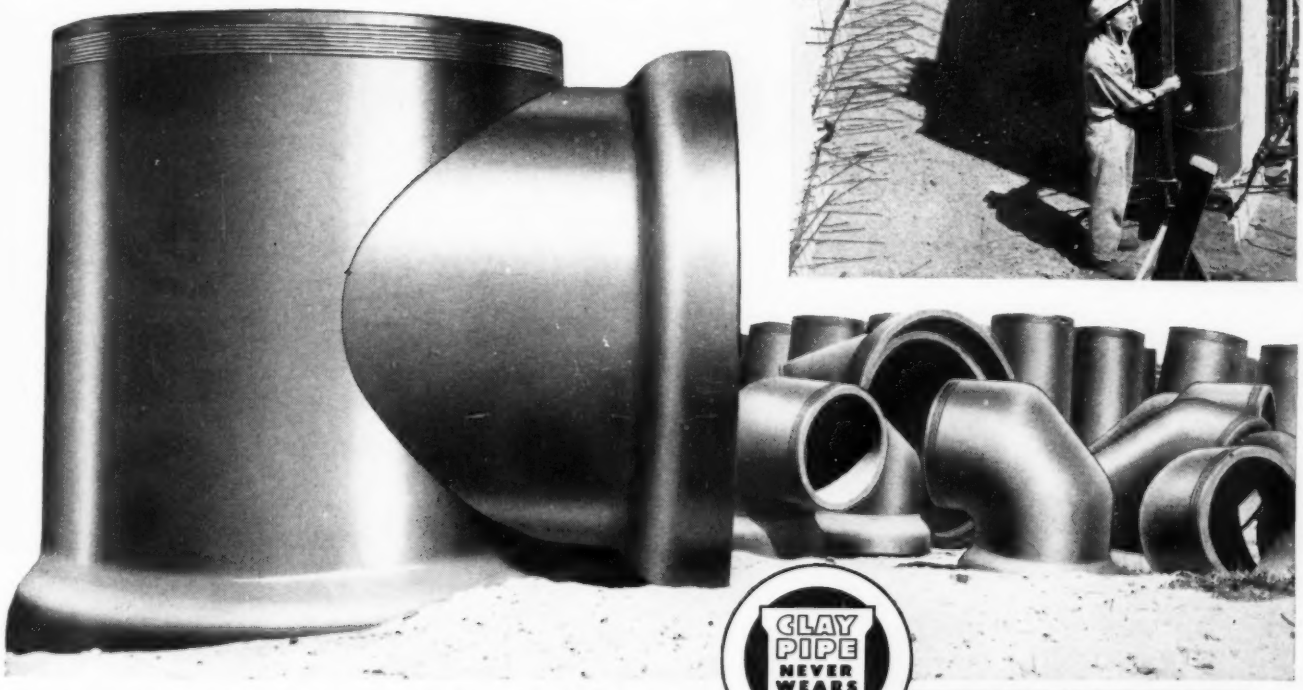
THE new sewerage treatment plant under construction at Hyperion, near Los Angeles, is designed to process waste disposal from an area populated by 3 million people. Its outfall sewer — 55 miles in length — is the longest of its type in the world.

Engineers in charge of the project rely on rust-proof, non-deteriorating Vitrified Clay Pipe and Clay Liner Plates to protect against acid attack. They know that Vitrified Clay Pipe is the *only* pipe that resists corrosion and crumbling . . . the *only* pipe that gives trouble-free service in *any* sewerage or drainage installation.



Corrosion-proof Vitrified Clay Liner Plates in huge sludge tanks protect masonry from acid-attack →

↓ *Vitrified Clay Fittings afford flexibility in laying and provide non-corrosive, non-deteriorating lines throughout the plant*



A.S.T.M. ACID TESTS HOLD NO TERROR FOR VITRIFIED CLAY PIPE

Vitrified Clay Pipe withstands A.S.T.M. tests for acid-resistance without mar or mark. Clay Pipe comes through 48 hours of immersion in fiery acid solutions with flying colors. The reason? *Vitrification* at temperatures exceeding 2,000°F. makes Clay Pipe TOUGH . . . welds the pipe into a solid, integrated conduit that *cannot* rust, corrode or crumble.

NATIONAL CLAY PIPE MANUFACTURERS, INC.

703 Ninth and Hill Bldg., Los Angeles 15, Calif.
1105 Huntington Bank Bldg., Columbus 15, Ohio
522 First National Bank Bldg., Atlanta 3, Ga.
100 N. LaSalle St., Rm. 2100, Chicago 2, Ill.

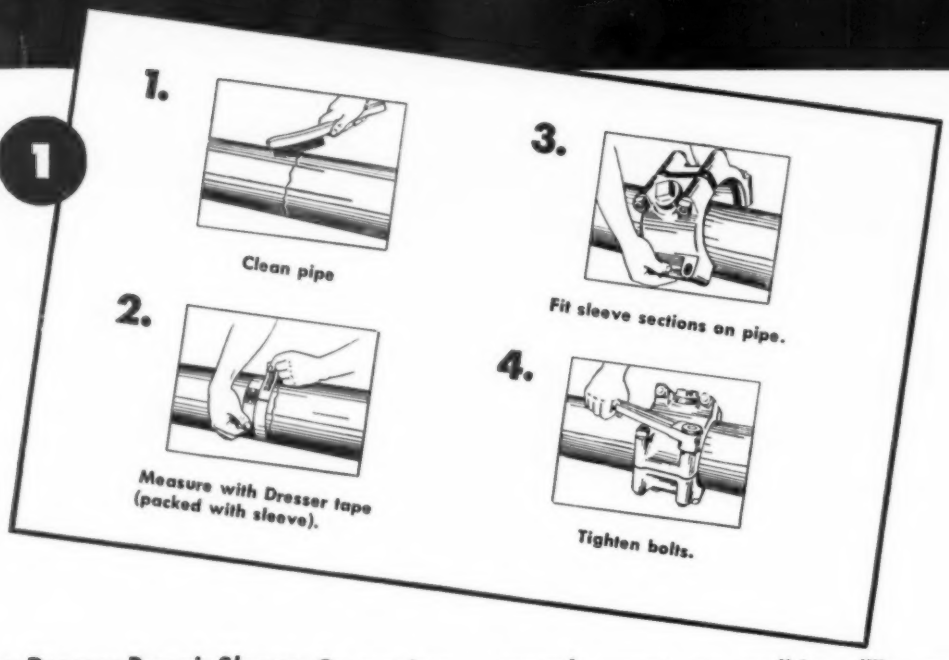
CLAY PIPE NEVER WEARS OUT!

Vitrified CLAY PIPE

C-749-1

2 EASY WAYS to repair water lines

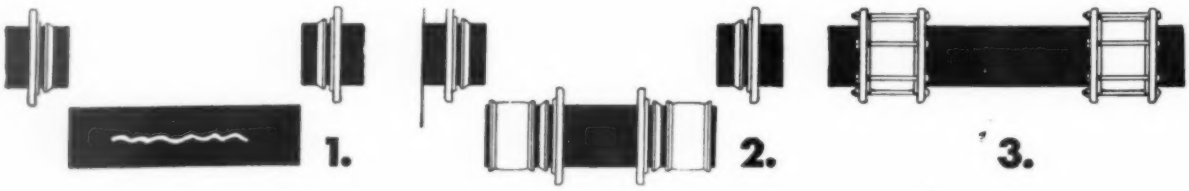
1



With a Dresser Repair Sleeve. On cast iron pipe, 4" to 8" in diameter, for splits, breaks or holes, use a Dresser Style 82 "Adjustable" Repair Sleeve. One man can make a permanent repair in a matter of minutes, using only a wrench. Sleeve is factory-assembled; no loose parts, no gaskets to cut and fit when seconds count, no caulking. The specially compounded Dresser gaskets afford a quick pack—a permanent seal.

Note: The Dresser Style 82 Repair Sleeve also offers the most convenient method for making a large tap off a small diameter main.

2



With Dresser Couplings. For breaks too long to be repaired with a sleeve, use Dresser Style 38 Couplings. Cut out a section of the pipe where the break occurs. Fit the couplings onto pipe ends. Put a new section in place. Bolt up the couplings. That's all there is to it. Dresser's resilient rubber gaskets assure a permanently tight repair . . . and guard against recurrence of the break by absorbing stresses and strains in the line.

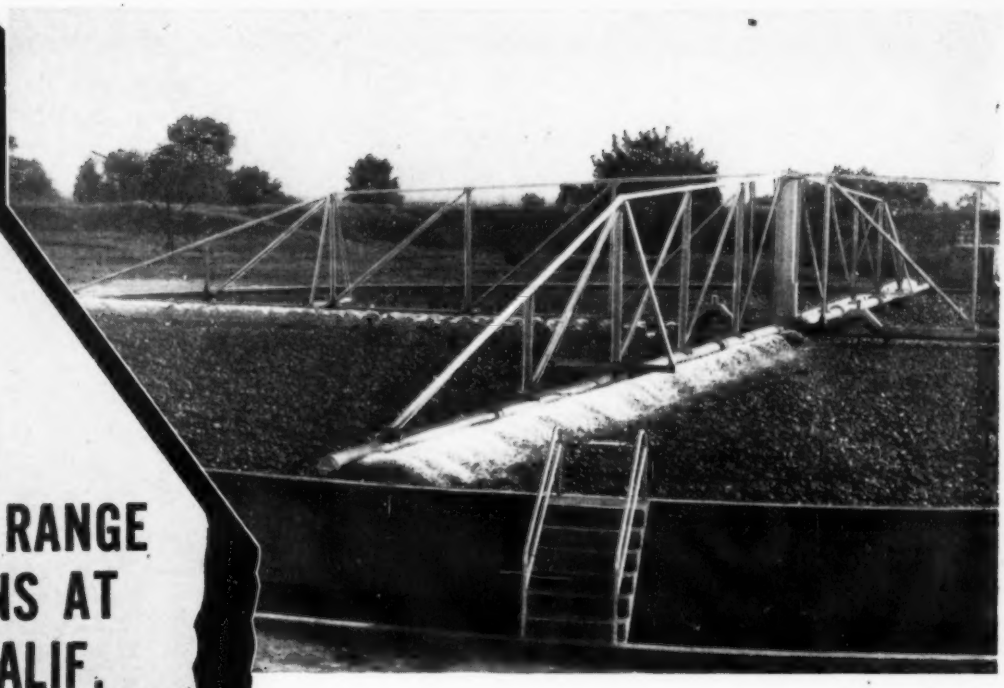
Note: This same procedure can be followed for cutting a new line into an old one, for inserting a valve into a line and for solving similar problems.

DETAILED, FACTUAL LITERATURE on how Dresser products can solve your water line repair and coupling problems is yours for the asking. Write today.

DRESSER COUPLINGS and REPAIR PRODUCTS

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. (One of the Dresser Industries) • In Texas: 1121 Rothwell St., Houston
In Canada: 629 Adelaide St., W., Toronto • Sales offices: New York, Chicago, Houston, San Francisco

LARGE P.F.T. ★ ROTARY DISTRIBUTOR MEETS WIDE RANGE OF CONDITIONS AT STOCKTON, CALIF.



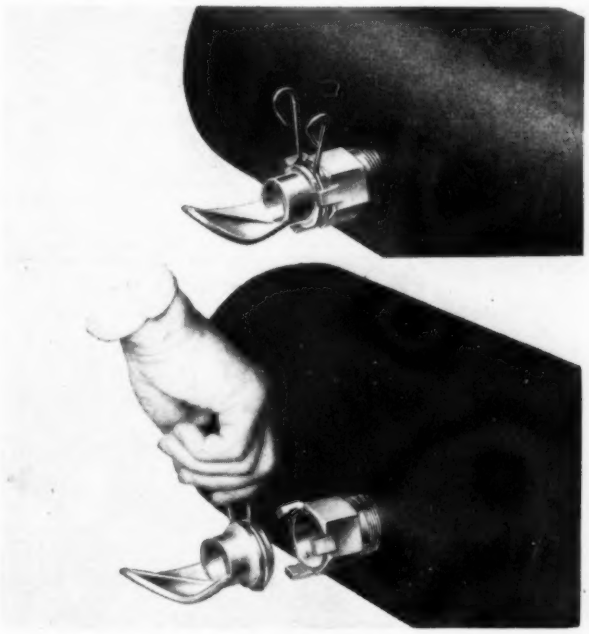
Completed in only 90 days from award of contract and giving highly satisfactory service, is the P.F.T. Rotary Distributor, 166' 0" in diameter, with four "cantilever" supported arms, installed at the South Sewage Treatment Plant, Stockton, Calif. Arms of genuine wrought iron pipe are 14" in diameter, reducing to 10" at outer ends.

Rushed to completion for installation prior to start of the canning season, this unit was designed to effectively handle 2,300 g.p.m. to 7,000 g.p.m. (3.67 to 10.0 m.g.d.). Range of flow is obtained by special P.F.T. 14" overflow siphons in two arms of the distributor.

Latest reports indicate that unit is handling a flow of 12.0 m.g.d. which is 20% more than the specified design flow. A large percentage of the sewage flow during the canning season consists of various types of cannery waste having a very high B.O.D.

Effective distribution over the surface of the bed is obtained by new type P.F.T. Removable Spreader Jets which are easily cleaned, while the machine is in operation where necessary. Jets have large circular orifices which tends to prevent clogging.

Plant designed by the engineering office of Clyde C. Kennedy, San Francisco.



The new P.F.T. Spreader Jet with readily removable orifice and deflector. Large orifice eliminates clogging.

P.F.T.

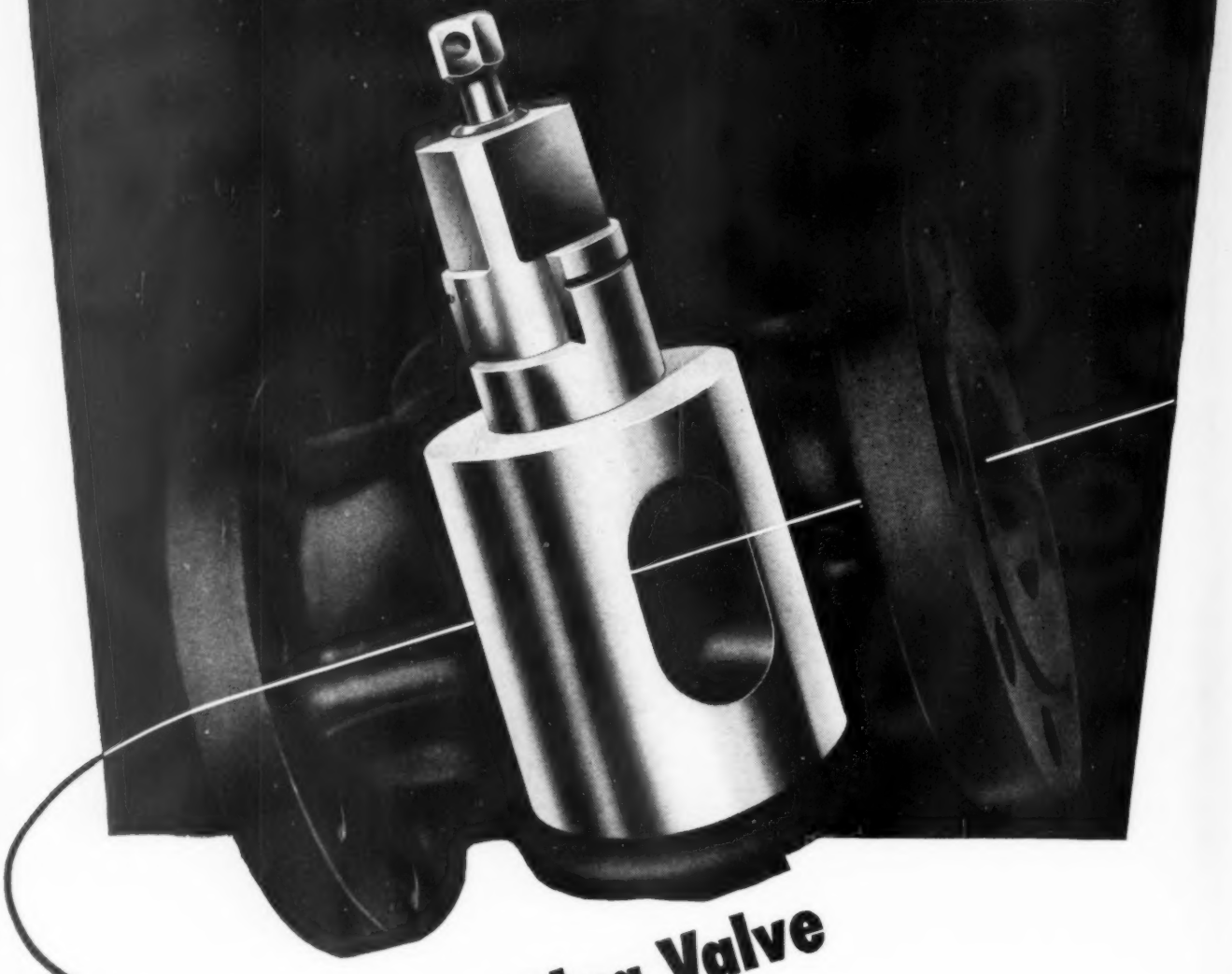
PACIFIC FLUSH TANK CO.

SEWAGE TREATMENT EQUIPMENT EXCLUSIVELY SINCE 1893

4241 RAVENSWOOD AVENUE CHICAGO 13, ILLINOIS

NEW YORK ● LOS ANGELES ● SAN FRANCISCO ● CHARLOTTE, N. C. ● DENVER ● TORONTO

OPERATES WITH EASE



Cylindrical Plug Valve

Quick turning is an outstanding advantage of a.c.f. design. No wedging in its seat. The precision-machined Cylindrical Plug, pressure lubricated on all seating surfaces is always free to turn. It could be critically important in your plant. Reason enough to give a.c.f. Lubricated Plug Valves preference.

a.c.f. CYLINDRICAL FULL PIPE AREA LUBRICATED **PLUG VALVES**

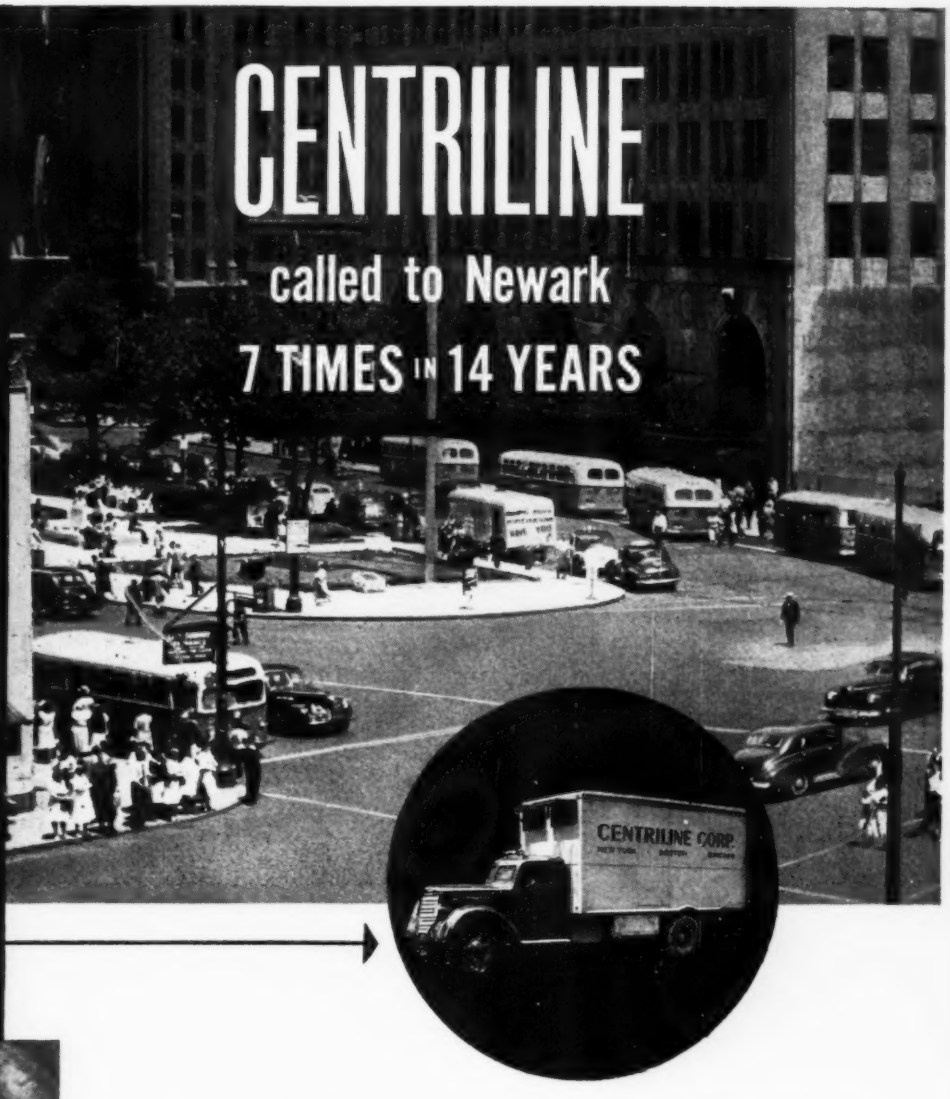
Representatives in more than 50 Principal Cities.

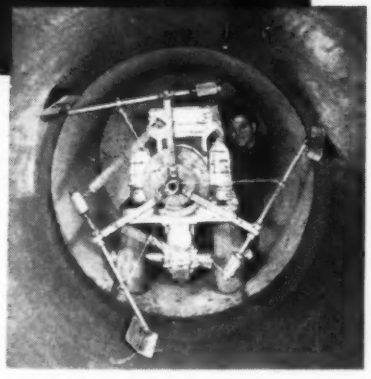
A.C.F. Valves are ideal for sewage operations. Ask for catalog 4-WS—American Car and Foundry Company, Valve Division, 30 Church St., New York 8, N.Y.

where performance counts . . . count on Centriline

CENTRILINE

called to Newark 7 TIMES IN 14 YEARS





IN 1935 Centriline did its first work for the city of Newark, N. J.—cleaned and lined with cement mortar 27,551 feet of 48" riveted steel pipe. The capacity of this 40-year old pipe was thereby increased 77%—*12% higher than the original capacity—and it has stayed there!*

That may explain why Centriline has been called back again and again to recondition more of Newark's vital water mains. To date, more than 40 miles of these mains have been Centrilined.

If your pipeline investment is under attack by tuberculation and corrosion—if your maintenance and pumping costs are rising—if your mains deliver less water at a time when you need more—call on Centriline. Like Newark, your city will find that it pays!

CEMENT MORTAR LININGS FOR WATER MAINS CENTRIFUGALLY APPLIED in strict conformity with A. W. W. A. Specifications.

CENTRILINE CORPORATION

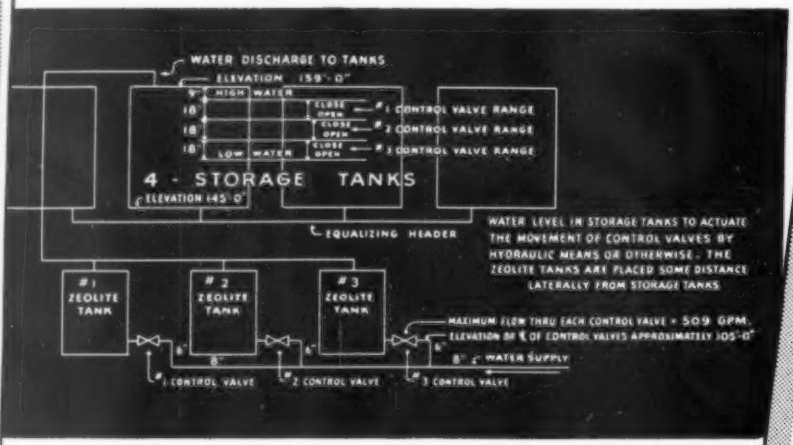
140 CEDAR STREET

NEW YORK 6, N. Y.

CENTRILINE PROCESS

R-S valvEvents

• EXCERPTS FROM THE R-S BOOK OF EXPERIENCE •


WATER DISCHARGE TO TANKS
ELEVATION 159'-0"
HIGH WATER
LOW WATER
#1 CONTROL VALVE RANGE
#2 CONTROL VALVE RANGE
#3 CONTROL VALVE RANGE
4 - STORAGE TANKS
ELEVATION 145'-0"
EQUALIZING HEADER
WATER LEVEL IN STORAGE TANKS TO ACTUATE THE MOVEMENT OF CONTROL VALVES BY HYDRAULIC MEANS OR OTHERWISE. THE ZEOLITE TANKS ARE PLACED SOME DISTANCE LATERALLY FROM STORAGE TANKS
#1 ZEOLITE TANK
#2 ZEOLITE TANK
#3 ZEOLITE TANK
MAXIMUM FLOW THRU EACH CONTROL VALVE = 509 GPM.
WATER SUPPLY
1 CONTROL VALVE
2 CONTROL VALVE
3 CONTROL VALVE

Automatic Control of Treated Water

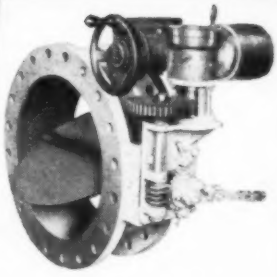
In the above installation, float switches control the three electric motor operated slow acting R-S Valves which maintain a constant supply of treated water in the four storage tanks. The result is simplified performance, minimum pressure drop, unexcelled flow characteristics and reduced maintenance.

Similar applications of power operated R-S Valves can be equipped with air diaphragm, oil or hydraulic cylinders for the control and shut-off of a multitude of materials. They are used advantageously to reduce, regulate and shut off pressure whether above or below atmosphere; to control liquid level; to relieve and control back pressure; to maintain a constant differential pressure; to control rate of flow; to control combustion, and govern the output of pumps, fans, engines and turbines.

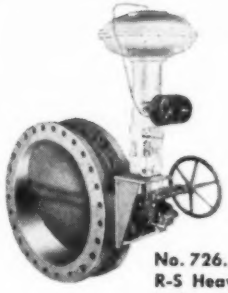
R-S Valves are precision engineered, metallurgically and mechanically. Adapted to elevated or sub-zero temperatures . . . 15 to 900 psi.

Consult with your local R-S representative. Look for the address and phone number listed under "R-S Products Corporation, Valves" or write direct.

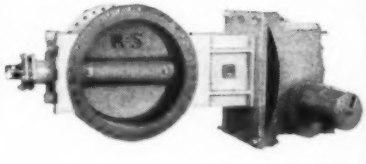
R-S PRODUCTS CORPORATION
Wayne Junction • Philadelphia 44, Pa.



No. 617. Float Switch Electric Motor Control for slow acting R-S Valve. Hand wheel for manual operation on gear reduction drive. Extended lever for operating sister valve in parallel line.



No. 726. 30-inch R-S Heavy Duty Valve with 125-pound American Standard flanges, steel diaphragm top and positioner, hand wheel control with declutching mechanism and outboard gooseneck bearing on operating shaft.



No. 658. 42-inch R-S Heavy Duty "H" Metal 125-pound Valve for high pressure and flow. Opens or closes completely in one second requiring 38,000 pounds torque.

No. 755. R-S Pipe Line Shock Absorbers (four models) eliminate shock and hammering in pipe lines carrying liquids of any nature. No moving parts . . . easily installed in any position.

...and Lynchburg proved it—twice

The municipal water system of Lynchburg, Virginia, was plagued by two manifestations of corrosion. One resulted in the presence of iron particles in the water (red water) at dead ends and fire hydrants; the other was the less noticeable but more costly product of corrosion known as tuberculation.

In the fall of 1941, the Lynchburg water department began a series of tests of Calgon, and as a result of these tests, started Threshold Treatment with 1 ppm of Calgon shortly before the beginning of 1942. At the same time, use of soda ash in the water system was discontinued.

After five years successful use of Calgon, the Department decided to make a thorough check of its effectiveness. Calgon treatment was discontinued and the use of soda ash resumed.

Within a few months, red water reappeared. Once more Calgon feeding was started, and once more corrosion difficulties ceased.

Lynchburg is only one of many hundred communities of all sizes where Threshold Treatment with Calgon is used to prevent scale, control corrosion, eliminate "red water" or stabilize water following lime softening.

Calgon representatives will be glad to discuss the use of Threshold Treatment in your plant.

*T. M. Reg. U. S. Pat. Off.

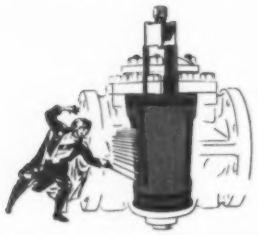
HAGAN HALL BUROMIN CALGON

calgon, inc.

A SUBSIDIARY OF HAGAN CORPORATION

HAGAN BUILDING PITTSBURGH 30, PA.

Attention, Nordstrom Valve Users:



LUBRICATE $\frac{1}{10}$, $\frac{1}{20}$, $\frac{1}{50}$, $\frac{1}{100}$ as often with Hypermatic
—THE miracle LUBRICANT

Automatic lubrication—a hit!

VES MAN-HOURS, SAVES LUBRICANT

e immediate and eager acceptance of Rockwell permatic lubricant has been phenomenal. Now, re than 5,000,000 Nordstrom valves can be autotically lubricated by changing to Hypermatic. ere's nothing to purchase but the lubricant. Impresse savings in man-hours will be made in servicing ır Nordstrom valves because Hypermatic works ile your maintenance men are absent. It automatily force-feeds and seals any voids which would cause kage. It stays energized for prolonged periods.

ROCKWELL Hypermatic
TRADE MARK PATENTS APPLIED FOR
LUBRICANT

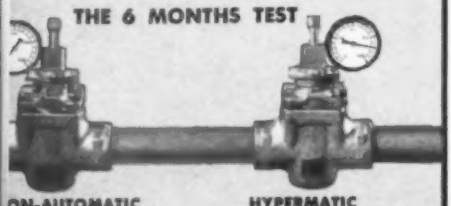
SELF-POWERED FOR SEALING ACTION

GENUINELY AUTOMATIC
Hypermatic is au matic — not depe ent upon pressure the pipeline whi can fail, or any m chanical contrivanc It stores its own e ergy.

KEEPS PRESSURIZED

IMMEDIATE DELIVERIES
Hypermatic lubricant is available for use in sewage disposal serv ices.

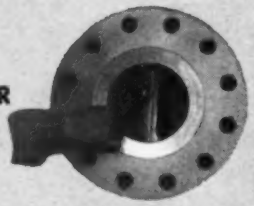
THE 6 MONTHS TEST



ON-AUTOMATIC
ricated valve on is pressurized to psi, using a nonomatic lubricant. ssure soon subs.

HYPERMATIC
Identical valve on same line, same pressure, using Hypermatic. After 6 months, pressure only slightly declined.

THE SCAVENGER TEST



Inject Hypermatic in any Nordstrom valve. Turn plug half open. Then scrape away all lubricant in plug's exposed vertical groove. Close valve for a few seconds. Then turn half open. Presto, —new lubricant has completely filled groove.

Gives Nordstrom valves greater efficiency, longer life

reason there are over 5,000,000 Nordstrom valves in service is because they are most dependable type of positive closure known to industry. Lubrication performs triple function of lubricating the plug, sealing the ports and jacking the plug. Lubrion is the "making" of the valve. There's no substitute for lubricant. It's vital. Now, have miraculously improved the lubricant by development of Hypermatic. Fundaitally, a valve is used to shut off a line. To do that, a valve must be in itself a perfect . Hypermatic keeps the valve sealed.

Nordstrom

IBRICATED VALVES KEEP UPKEEP DOWN

Request Hypermatic Bulletin V-211

NORDSTROM VALVE DIVISIO
Rockwell Manufacturing Co.
400 N. LEXINGTON AVENUE, PITTSBURGH
Sales Offices in Principal Cities

"City highly endorses Badger Meters and Testing Machines"

That's what the mayor of one Illinois city wrote to another, adding: "Operation of these meters has always been satisfactory and maintenance-cost very reasonable . . . in our meter shop, a Badger Testing Machine enables us to see the quality of our work, which was not possible before we bought the Testing Unit."

In over 5000 communities, waterworks men know that "It pays to BUY BADGER".

Every waterworks superintendent should have the NEW BADGER CHART No. 689 (Practical Plan for Meter Storage Rack). WRITE today for this chart . . . no charge.

BADGER METER MFG. CO., MILWAUKEE 10, WIS.

BRANCH OFFICES:
NEW YORK CITY • PHILADELPHIA • WORCESTER, MASS. SAVANNAH, GA. • CINCINNATI • CHICAGO • KANSAS CITY, MO. • WACO, TEXAS • SALT LAKE CITY, UTAH PORTLAND, ORE. • SEATTLE, WASH. • LOS ANGELES

You will find a Badger Meter size and type for every waterworks service. Shown here are Model SC-IOT (for warm climates), and Model A-IOT (for cold climates) . . . sizes 5/8" to 1¼" . . . other models in sizes up to 12". Write for complete information and prices.

BADGER Water METERS

ACCURACY • LOW-COST MAINTENANCE • DURABILITY • SENSITIVENESS

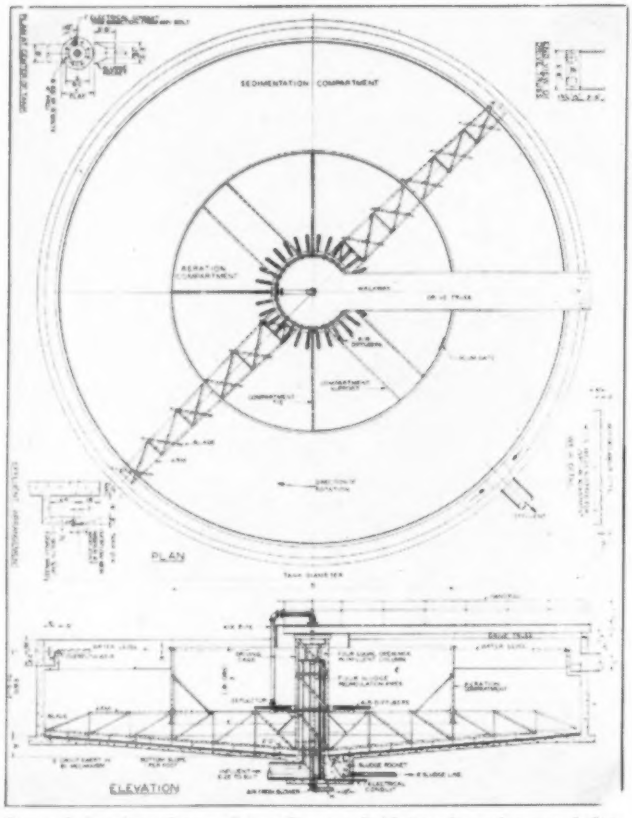
PROBLEM:

HIGH DEGREE OF PURIFICATION AT LOW COST

Solution:

THE PROCESS OXIDATOR

Engineers choose Process Oxidator for new sewage plant to help meet rigid state health requirements.



General drawing of one of two Process Oxidators in series now being constructed at Oceanside, California. Consulting Engineers: Quinton Engineers Ltd. Contractor: Theodore Gregory.

A modern sewage plant, designed to serve 20,000 people, is now under construction at Oceanside, California. Due to the location of the city's sewage collection system, the new plant is situated near a residential district. The California State Board of Health stated: "There shall be no noxious or offensive odors, gases or fumes of sewage . . . such as they may constitute a public nuisance." The Process Oxidator was chosen as the clarification unit that would answer this demand.

(Patents Pending)

Actual performance of other installations prove that The Process Oxidator units mean:

- Improved clarification
- Higher removal of suspended matter
- Increased grease removal
- Minimum scum handling
- Greater reduction in bio-chemical oxygen demand
- Elimination of odors by maintaining sewage in fresh condition
- Lower capital cost and upkeep.

Investigate this new leader in economy and efficiency! Write to either address below for additional information. Process Engineers Inc. maintain a staff of specialized engineers who are glad to be of service.

PROCESS ENGINEERS INCORPORATED

821 MARKET STREET
SAN FRANCISCO 3, CALIF.

6381 HOLLYWOOD BLVD.
LOS ANGELES 28, CALIF.

NOT JUST ½ NOT JUST ½ ...but all 3

VENTING

Permits escape of large quantities of air, as pipe line is being filled with water.

AIR INLET

Permits air to enter pipe as line is being drained.

PRESSURE AIR RELEASE

Allows accumulated air under pressure to escape from high points of pipe lines.

YOU GET ALL 3 SERVICES FROM THE

RENSSELAER

AIR and VACUUM and AIR RELEASE VALVE

Here is a Valve that will give you COMPLETE service on water mains, turbine pump discharge, bowls of booster pumps, air tanks, sand traps – in fact, wherever you require COMPLETE CONTROL of air inlet, discharge, or of air and water levels.

It has the simplicity and reliability you will find in all Rensselaer products. It will not blow shut under high velocity air discharge. It closes positively under low water head. It has a full clear passage for air, reducing friction to minimum. All internal working parts are solid bronze. Special air release rubber valve has long life, is tight-seating. Complete details on request.

Do you want to know more about this triple-service Valve, or any of the many other Rensselaer products? Send for our Representative. There is one near you, ready to serve without obligation on your part. Call him today.

LEADERSHIP FOR OVER 65 YEARS

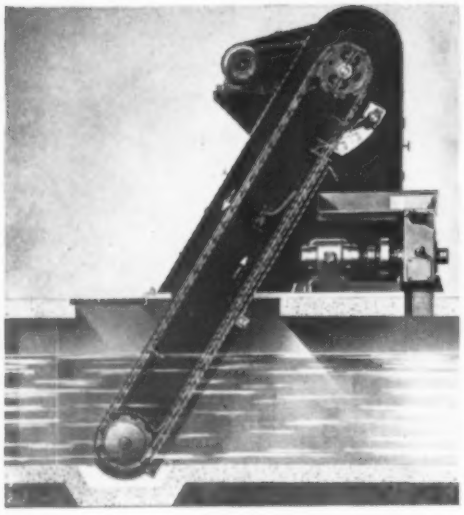
RENSSELAER

Gate Valves • Square Bottom Valves • Tapping Valves and Sleeves
Hydrants • Check Valves • Air Release Valves

RENSSELAER VALVE COMPANY • TROY, N. Y.

Division of Neptune Meter Company

Atlanta, Bala-Cynwyd, Pa., Chicago, Denver, Haverhill, Mass., Hornell, N. Y., Kansas City, Los Angeles, Memphis, Oklahoma City, Pittsburgh, San Francisco, Seattle, Waco

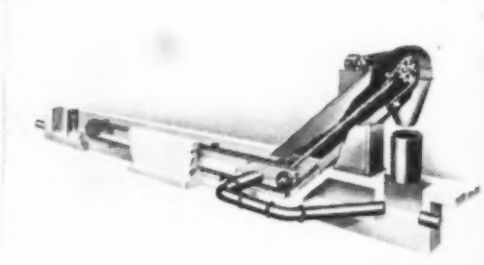


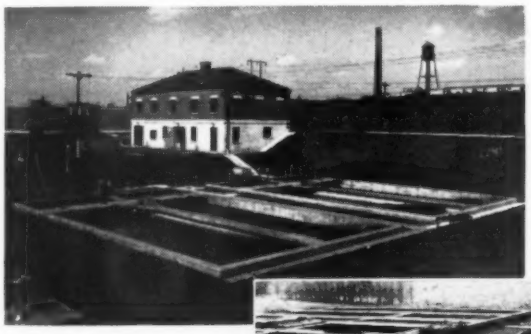
REX MECHANICALLY CLEANED BAR SCREENS AND TRITURATORS are neat, streamlined units that provide an efficient means of removing large solids from liquids and reducing them in size. Reduced material is returned into the sewage flow for quick and efficient handling in settling tanks and digesters.

It's a Matter of Record...

. . . and in plant after plant, the records show that Rex Sanitation and Process Equipment provides unequaled efficiency . . . sets the standards for economical, long-life operation

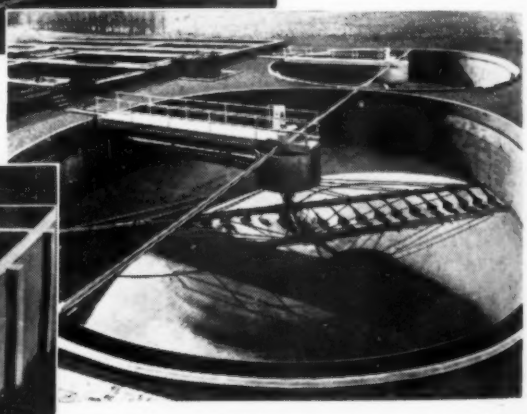
Whether it's a large plant or small, a look at the figures will convince you that Rex Equipment is right for your operation . . . primary or complete treatment . . . domestic or industrial waste. Specially trained Rex Sanitation Engineers will be happy to assist you with your individual problems. For all the facts, write for your copy of Bulletin No. 48-41. Chain Belt Company, 1610 West Bruce Street, Milwaukee 4, Wis.



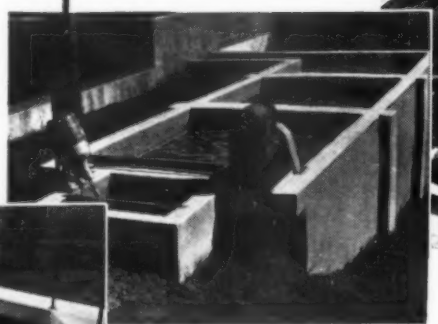


REX CONVEYOR SLUDGE COLLECTORS combine the well-known advantages of the rectangular settling tank with a rugged and efficient form of sludge removal mechanism. Whether handling primary sludge or light flocculent solids, their performance is efficient and economical.

REX GRIT EQUIPMENT with its exclusive recirculating principle, effectively separates and removes inorganic solids from liquids. No grit washer is required. Rugged construction assures long, economical service.



REX SLO-MIXERS AND FLASH MIXERS assure rapid disbursement of chemical throughout the liquid, followed by a gentle, multi-stage slow mixing for optimum floc formation. Rex Slo-Mixers eliminate short-circuiting and effect savings in chemicals.



REX VERTI-FLO delivers a highly clarified effluent with an extremely short detention period. It provides maximum tank capacity for any desired tank size and maximum practical weir length. The combination of large weir length and low vertical velocities assures a clearer effluent, far greater capacity at minimum cost.

REX TOW-BRO SLUDGE COLLECTORS assure accurate control of sludge removal over a wide range of withdrawal rates through their exclusive design. Sludge is removed immediately on contact instead of the usual plowing or scraping. Greater sludge concentration, greater operating flexibility, and a clearer effluent are a few of the many advantages.

CHAIN BELT REX COMPANY

SANITATION EQUIPMENT

THE MUELLER IMPROVED HYDRANT

Comparison PROVES MUELLER BEST

1. **SELF OILING---** *Perpetual, Automatic - - - Ends all lubricating troubles!*
2. **NON-FREEZING---** *Top sealed away from water zone. Positive dual drain valves. Bronze weather cap protects bearing surfaces!*
3. **NO CORROSION OF WORKING PARTS---** *All parts are either bronze, isolated from water, or protected by lubrication!*
4. **NO BINDING OF VALVE STEM---** *High tensile strength steel rod with fused bronze bearing surface!*
5. **NOZZLES POINTED TO ANY DIRECTION---** *Safety flange permits swiveling barrel to any degree of a circle!*
6. **EASY SEAT REMOVAL---** *Bronze to bronze threads in shoe. All parts removable through top!*
7. **FULL FLOW---** *Large barrel diameter free from obstructions that cause friction losses. Sweeping nozzle curves!*
8. **NO BARREL BREAKAGE---** *Economically replaced safety flange and coupling protect vital parts!*
9. **NO LEAKAGE OF SEAT RING THREADS--** *Ever-lasting copper gasket prevents it!*
10. **NO SHUTTING OFF OF WATER---** *Shut off only when main valve is removed!*
11. **NO FLOODING OF STREETS---** *Compression type main valve is held seated by water pressure!*
12. **EASILY LENGTHENED---** *Extension sections provide for raised grade levels. No digging—no water cut-off!*
13. **NO PACKING---** *"O" ring gaskets eliminate all packing in the Bonnet section!*
14. **DURABLE MAIN VALVE---** *Special water-proof, cut-resistant chrome tanned leather. Has double the life of ordinary leather!*
15. **NO DIGGING---** *A truly permanent installation!*

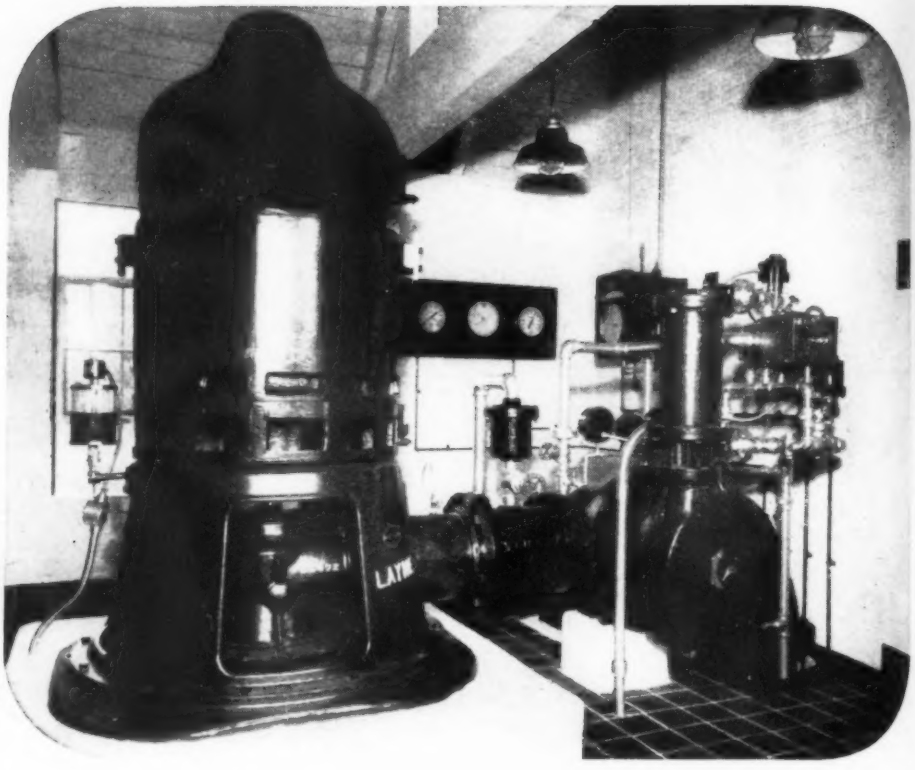
Compare these features with those of any other hydrant and you'll see why MUELLER is the outstanding hydrant today ! ! !

DEPENDABLE SINCE 1857 FULLY WARRANTED OUR 92nd YEAR

MUELLER CO.

FACTORY: *Chattanooga, Tenn.* MAIN OFFICE AND FACTORY: *Decatur, Ill.*
OTHER FACTORIES: *Los Angeles, Cal.* • • • • *Sarnia, Ont. Canada*

"Better Built—
for Better Service"



ABOUT DISCARDING OLD PUMPS

Your old, worn out and expensive to operate pumps can be replaced with the famous Layne Vertical Turbines to obtain a greater volume of water at substantially lower operating cost. Sizes range from 40 to 16,000 gallons per minute. Drives may be by electric motor, gas, gasoline, Diesel or steam engine—or by steam turbine. Send for the Layne Vertical Turbine Pump catalog.

WHAT'S SO IMPORTANT ABOUT HIGH EFFICIENCY

High efficiency is the one and only feature that can keep water system operation cost low—and profitable. Layne can claim the highest of all on today's market. Certainly no other is backed up by so many years of skillful engineering and advanced design. Nor is there any other that has finer quality of materials or more ruggedness of construction;—none that consistently give so many years of highly satisfactory service.

Layne's methods of building well water systems come from nearly three-quarters of a century of world-wide experience. Layne is acknowledged to have the "know how" that omits guess work, disappointment in needed volume and patch ups in construction errors by the less experienced. Layne systems, size for size, are built to, and actually do produce more water than can be obtained by the conventional type of installation.

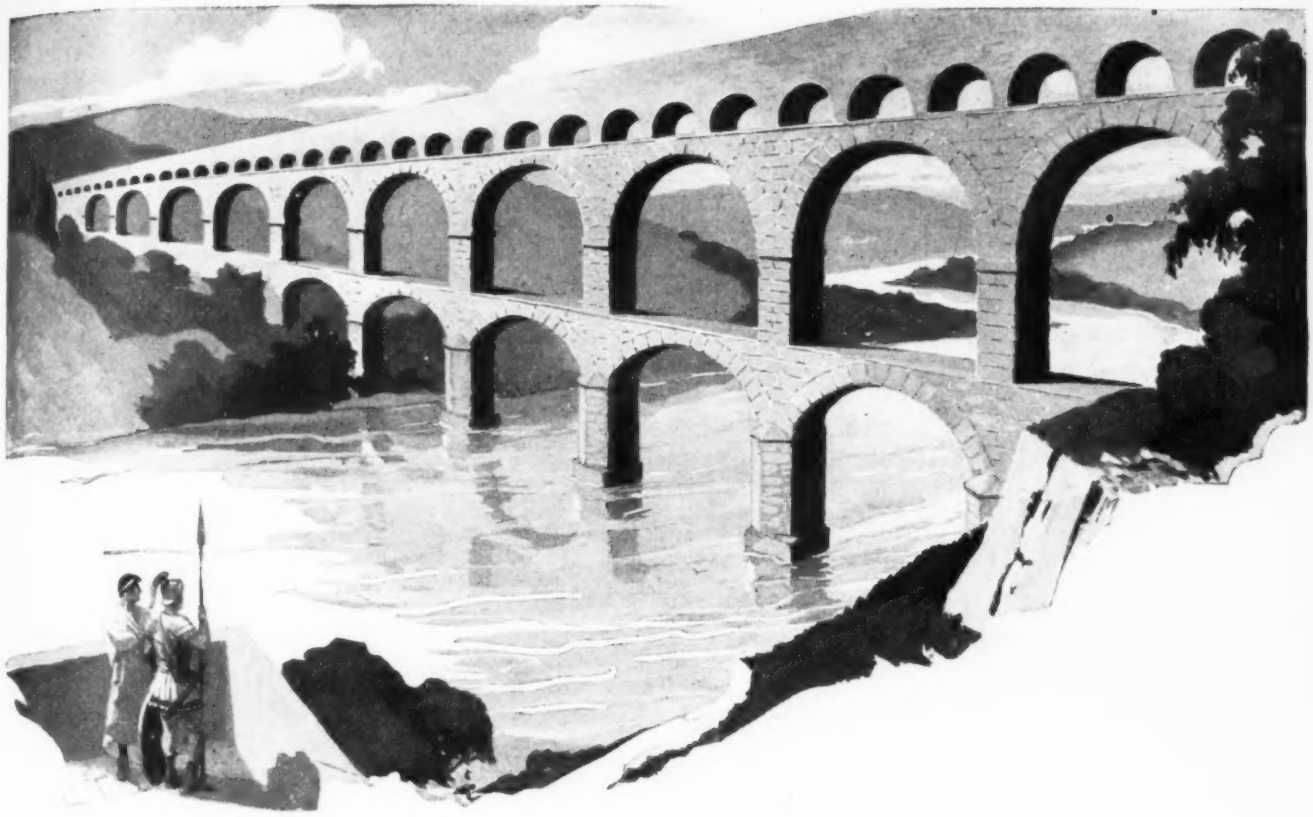
It is good business to make high efficiency a yardstick in buying a well water system. It is good to know that from Layne you automatically obtain the high efficiency that continually keeps your water production at rock bottom cost. In choosing a Layne system you are following the preference of thousands of cities and industries in all parts of the world. For further information, catalogs, etc., address

LAYNE

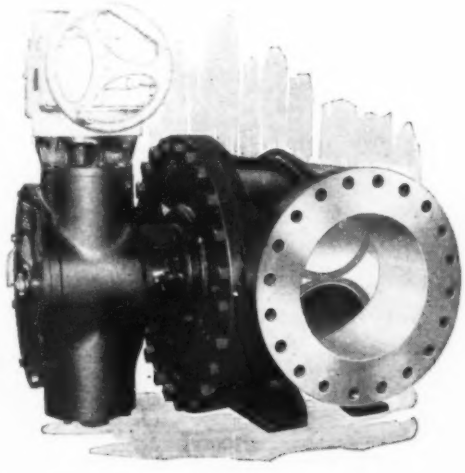
LAYNE & BOWLER, INC.
GENERAL OFFICES, MEMPHIS 8, TENN.

WELL WATER SYSTEMS

ASSOCIATED COMPANIES—Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Pacific, Inc., Seattle, Wash. ★ The Layne-Texas Co. Ltd., Houston, Tex. ★ Layne-Western Co., Kansas City, Mo. ★ Layne Minnesota Co., Minneapolis, Minn. ★ International Water Corp., Pittsburgh, Pa. ★ International Water Supply, Ltd., London, Ont. ★ Layne-Hispano Americana, S.A., Mexico, D. F. ★ General Filter Company, Ames, Iowa.



a "Big Inch" of olden days ~



GENIUS has raised her head in every age. So today's Masterbuilders are but the projeny of antiquity's great inventors. Even principles are related. An example of this is the plug cock design for fluid control, embodied in the Smith Rotovalve, which has come down through the ages unchanged! Send for your copy of "Rotovalves by Smith."

If It's Hydraulics ~ Put It Up to Us!

S. MORGAN SMITH Co.

YORK, PENNA. U.S.A.

This servant
wears
a Crown
—at
FORT WORTH, TEXAS

PITTSBURGH • DES MOINES

Elevated STEEL TANKS

New beauty . . . new efficiency in large-capacity elevated tank design by Pittsburgh-Des Moines! This handsome *Obloidal* Elevated Steel Tank stores 1,000,000 gallons of water with a head range of 25 feet. 88 feet in diameter, on an 88-foot tower, the gleaming crown of this new tank is visible new evidence of *modern water storage* for Fort Worth.

Do you have our new Elevated Steel Tank brochure?

PITTSBURGH • DES MOINES STEEL CO.

Plants at PITTSBURGH, DES MOINES and SANTA CLARA

Sales Offices at:

PITTSBURGH . . . . . 3418 Neville Island
NEW YORK . . . . . Room 918, 270 Broadway
CHICAGO . . . 1222 First National Bank Bldg.
DES MOINES . . . . . 919 Tuttle St.
DALLAS . . . . . 1223 Praetorian Bldg.
SEATTLE . . . . . 926 Lane Street
SANTA CLARA, CAL. . . . . 625 Alviso Road

~~1,300,000,000~~

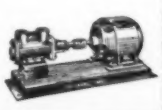
Soon 1,433,000,000 gallons

Total Capacity of De Laval Pumps in the City of Chicago . . ~~1,300,000,000~~ 1,433,000,000 Gallons Daily

In the year 1920, the City of Chicago installed its first turbine-driven centrifugal pump—a unit of 60 mgd capacity in the Central Park Station. The performance, trouble-free operation, economy and flexibility of this unit proved to be so satisfactory that additional De Laval turbine-driven pumps were installed in rapid succession.

Today, the City of Chicago is served by a total of 16 De Laval turbine-driven pumps and 5 De Laval motor-driven pumps having a total capacity of one billion, three hundred million gallons daily.

SEND FOR CATALOG 10-7R-WS



DE LAVAL

DE LAVAL STEAM TURBINE CO., TRENTON 2, N. J.

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

WW7

P.S. The City of Chicago ordered two more De Laval Turbine Driven Pumping Units soon after the above ad was written. These units will increase the total capacity of De Laval waterworks pumps in that city to 1,433,000,000 gallons daily.

THE SILENT WATCHMAN

DIXIE TANK AND BRIDGE CO.

3523 LAMAR AVE. P. O. BOX 14
MEMPHIS 1, TENNESSEE

Complete Service for Elevated Water Tanks—
Nation Wide Service—30 Years Experience

KEEP THE SAFETY FACTOR IN
YOUR TANK THE DIXIE WAY

By welding seams, pits and rivets which gives a riveted tank 15% more Safety Factor than it had when built. No rivets removed, water supply maintained while work is in progress. On completely reconditioned jobs, the painting is guaranteed for five years, repairs guaranteed for ten years, provided the tank is painted every five years. Yearly inspection, making all adjustments, if any, without additional cost.

Write Us for Free Copy of Publication

SOUND PRINCIPLES OF WATER TANK MAINTENANCE and TANK TALK, by W. A. RILEY

—SAFETY—SERVICE—SATISFACTION—

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THE LARGEST ORGANIZATION OF ITS KIND GIVING SAFE MAINTENANCE AT LOW COST

Superior Performance

TENNESSEE CORPORATION
Ferri-Floc
FERRIC SULPHATE
Atlanta, Georgia

...of a Superior COAGULANT

SEVEN ADVANTAGES OF FERRI-FLOC

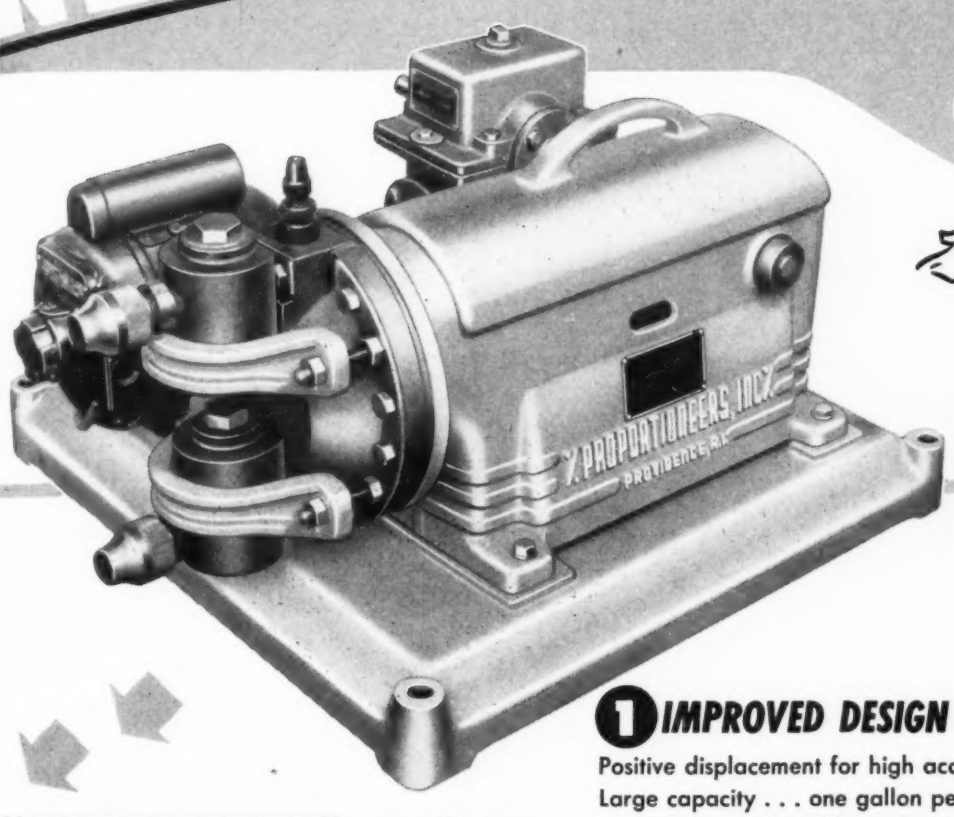
1. Coagulation is effective over a much wider pH range than with other coagulants. Color flocs may be formed in the very acid range where other coagulants may not be employed. On the other hand, true hydrated ferric oxide flocs may be formed at pH 9-10 or even higher for the removal of turpidity and manganese.
2. The time required for floc formation, conditioning and settling is in many cases considerably shorter than that required for other coagulants.
3. Filter runs have been markedly increased in several cases.
4. Manganese is successfully removed at pH values above 9.
5. Effluents may be produced which are exceedingly low in both iron and aluminum.
6. Hydrogen Sulphide is removed and taste and odors improved.
7. Ferri-Floc does not seem to stick to sand grain to form mud balls, and is subject to less "breaking through" on the filters.

Let us send you FREE, this valuable booklet on Ferri-Floc.
Write TENNESSEE CORPORATION,
Grant Bldg., Atlanta, Ga.

Many of the country's larger plants are now recognizing the advantages offered by Ferric Coagulants and are taking advantage of them through Ferri-Floc. — Ferri-Floc eliminates the troubles encountered with other coagulants by improving general quality, reducing overall cost. — All of this is accomplished without costly changes in plant equipment.

TENNESSEE CORPORATION
Atlanta, Georgia — Lockland, Ohio

GOOD NEWS! A New Ferro-Feeder Improved 3 Ways



%PROPORTIONEERS% new Ferro-Feeder is the ideal proportioning pump for sludge conditioning . . . it's specially made to feed 35% to 40% solutions of ferric chloride or other corrosive liquids against pressures to 20 p.s.i. In design, construction, and operation, the Ferro-Feeder incorporates the experience gained in the manufacture of over 27,000 %Proportioneers% chemical feeders.

1 IMPROVED DESIGN

Positive displacement for high accuracy.
Large capacity . . . one gallon per minute.
Feeding rate adjustable while unit is operating.

2 IMPROVED CONSTRUCTION

Soft rubber, whipcord reinforced diaphragm.
Hard rubber check valves and reagent head.
Long-lived Hastelloy "D" and other non-corrosive metals.

3 IMPROVED OPERATION

Automatically feeds in proportion to variable flow.
Delivers chemical to upper levels under pressure.
Easily cross-connected to sewage pump and other equipment or direct chain driven from sludge elevator sprocket.

Write today for complete information

% PROPORTIONEERS, INC. %

9N CODDING STREET, PROVIDENCE 1, R. I.

YOUR *Trident Representative*

is a helpful man to know

IN addition to his job of selling water meters, he is well qualified to help you with your metering problems, both in the field and in the shop. He will help you with the proper selection of meters, with their repair and testing—in short, he'll help you to GET MORE MONEY for the water you pump, and to reduce your meter maintenance costs.

***Yes,** your Trident Meter Representative is a helpful man to know. Don't hesitate to call him in.*

A GOOD METER PLUS GOOD SERVICE

A PERFECT COMBINATION

Trident Meters are not only accurate over a wide range of flows, but retain their sensitivity to low flows for the longest period of time

Even after Trident Meters have been in service for a long time, they can be quickly, easily and economically repaired to restore their original accuracy and sensitivity.

A well planned program of meter testing and repairing can easily be put into operation. It needs no elaborate equipment. For valuable information on this subject, ask for our Manual—"Planned Meter Repair and Testing." Your Trident representative will be glad to assist you.

Send for your copy Today

Trident is a Neptune Meter Company *Trademark*

209

NEPTUNE METER COMPANY • 50 West 50th Street • NEW YORK 20, N. Y.
Branch Offices in Chicago, San Francisco, Los Angeles, Portland, Ore., Denver, Dallas, Kansas City, Louisville, Atlanta, Boston.
NEPTUNE METERS, LTD., Long Branch, Ont., Canada

WATER & SEWAGE WORKS

Vol. 96, No. 12 **DECEMBER, 1949**

A Gillette Publication

BOSTON MEETING OF F.S.W.A. A RECORD BREAKER

New England Sew. Wks. Assn. Host to 821

Presidents

Incoming
A. H. Niles
Engr.-Supt.
Div. Sew. Disp.
Toledo, Ohio

Outgoing
V. M. Ehlers
Ch. San. Engr.
Tex. Dept. H'lth
Austin, Tex.

WITH the New England Sewage Works Assn. acting as host, the Federation of Sewage Works Assns. held a record breaking convention in Boston, Mass., between Oct. 16 and 20.

Although the meeting proper did not begin until the 17th, the Board of Directors met on Sunday the 16th and a registration booth which was set up registered 170 persons that day—a first day record. By Monday night the registration reached 653; by Tuesday night it was 770, and before the banquet on Wednesday night the record had been reached at 821 (9 more than the 1946 meeting in Toronto). Not only was the record broken for total attendance but the registration of men was 679, or 44 more than last year at Detroit. Ladies' registration was 142 this year.

So much for registration statistics; let's look at what drew this record crowd. Fourteen scheduled papers plus an Operators' Forum and an Industrial Waste Forum, with 29 manufacturers' exhibits, two inspection trips, an illustrated lecture, a luncheon, a banquet and dancing plus special trips for the ladies and renewed friendships constituted the attractions. It was a gratifying meeting to the hosts, the program committee, the officers, and the exhibitors, for the technical sessions, the meals, and the exhibits were all well attended.

Entertainment

The program for the ladies was probably one of the most ambitious ever undertaken, and credit is due to the thirteen ladies of the New England Sew. Wks. Assn. ladies' entertainment committee headed by Mrs. T. A. Berrigan of Boston. Beginning with a Tea Party (sponsored by the New England Sew. Wks. Assn.) on Monday afternoon at the Women's City Club (the famous old "Twin Houses") the ladies were whirled through a continuous selection of historic sights of Boston, Charlestown, Cambridge, Lexington, Concord, and South Sudbury. Bunker Hill Monument, Navy Yard, the Frigate Constitution, Paul Revere's house, the Isabella Stewart Gardner Palace, the home of Longfellow, the world famous glass flowers at the Agassiz Museum, the Concord Battle Ground, the Christian Science Mapparium, and the Wayside Inn: these were the places the ladies saw and the men wished they could have seen.

Emerson Award
W. J. (Bill) Orchard
Gen. Mgr.
Wallace & Tiernan
Newark, N.J.
(For service to the Federation as long time Chairman of Finance and Convention Management Committees, etc.)

Vice President
R. E. Fuhrman
Supt.
Sew. Tr. Plt.
Washington, D.C.

Secretary
W. H. Wisely
Exec. Secy.-Ed.
F.S.W.A.
Champaign, Ill.

Monday evening was given over to an informal reception to enable members and guests to meet the officers (and their wives) of the Federation and the New England Assn. Entertainment following the reception featured an illustrated lecture by Bradford Washburn, Dir. of the Boston Museum of Science. Called "Operation White Tower" this pictorial story of the expedition to the top of Mt. McKinley in Alaska proved as the announcement said "a thrill-packed treat."

New Federation Officers

At the annual meeting of the Board of Directors, the following officers were elected to serve for the ensuing year:

President
A. H. Niles, Engineer Supt.
Div. of Sewage Disposal
Toledo, Ohio

E. Sherman Chase
Partner
Metcalf & Eddy
Boston, Mass.
(Local Arrangements)

F. W. Gilcreas
Asst. Dir.
Div. of Lab.
N.Y. H'lth Dept.
Albany, N.Y.
(Program)

Convention Committee Chairmen

L. H. Enslow
Editor
"W't'r & Sew. Wks."
New York City
(Publicity)

T. A. Berrigan
Dir. Sew. Div.
Metr. Dist. Comm.
Boston, Mass.
(Finance)

C. N. Sawyer
Assoc. Prof.
Harvard Univ.
Cambridge, Mass.
(Entertainment)

E. B. Cobb
Cons. Engr.
Metcalf & Eddy
Boston, Mass.
(Hotel Arrangements)

Vice President
R. E. Fuhrman, Supt.
Blue Plains Sewage Works
Washington, D.C.

Treasurer
W. W. DeBerard, City Engineer
Chicago, Ill.

The new Director-At-Large is **Richard H. Gould,** Director, Div. of Sewage Disposal, Dept. of Public Works, New York City.

W. H. Wisely was appointed Executive Secretary-Editor for a period of three years. **Herbert Orland** continues as Asst. Secy.

Honors and Awards

As is customary, the annual banquet was the setting for the presentation of honors and awards.

Harrison Prescott Eddy Award
(For Outstanding Research Contribution)
John W. Hood, Supt.
Sewage Treatment Works
Ridgewood, N.J.

George Bradley Gascoigne Award
(For Outstanding Plant Operation)
Wilbur N. Torpey, San. Engineer
Dept. of Public Works
New York, N.Y.

Charles Alvin Emerson Award
(For Meritorious Service to the Federation)
William J. Orchard, Gen. Mgr.
Wallace & Tiernan Co., Inc.
Newark, N.J.

Past President's Certificate
George S. Russell, Pres.
Russell & Axon, Cons. Engrs.
St. Louis, Mo.

The **Arthur Sidney Bedell Awards** for meritorious service to member associations were made to the following: F. L. McDonald (Ark.); Walter A. Sperry (Cent. States); Harold W. Streeter (Fed.); R. P. Farrell (Ky.-Tenn.); W. F. Shephard (Mich.); Harry P. Croft (N.J.); Wm. M. Piatt (N. Car.); Carl E. Green (Pac. N.W.); Victor M. Ehlers (Texas).

The **William D. Hatfield Awards** for Outstanding Operation Reports were made to George Martin, Chief Engr. and Supt., Green Bay Metropolitan Sewerage Dist. for his operation report on the Green Bay plant (serving between 10,000 and 100,000 population), and to R. D. Craun, Supt. Rochester, Mich., for his operation report on his plant (serving less than 10,000 population).

Membership

According to the report of Exec. Secy. W. H. Wisely, membership on Sept. 30, 1949, was 5,119, an increase of 6.6 per cent over the previous year. Actually the increase was somewhat better than these figures, inasmuch as on that date, the Pennsylvania Assn. showed a loss of 50 members for the year. Fifteen days later most of this loss had been wiped out by payment of delinquent dues. By the time the Board met on Oct. 16, the actual membership in the Federation was 5,170. At this rate of growth, the Federation will easily top the slogan suggested in 1947 by "Doc" Symons, to wit: "5500 for the 25th anniversary in '52."

With the affiliation of the Sewage Works Section of the Louisiana Water and Sewage Conference, the total number of associations in the Federation reached 35, although the Argentine Group is somewhat inactive at the moment.

The numerical gain membership prize of $100 was earned by the Ohio Conference on Sewage and Industrial Wastes, which increased its membership by 78 during the year. Honorable mention went to California (57), Iowa (43), and Michigan (39).

An increase of 220 per cent won the $100 prize for the Sewage Works Section of the Alabama Water and Sewage Assn. Runners up were Iowa (60 per cent); Arkansas (41 per cent) and Ohio (33 per cent).

The N.Y. State Sewage Works Assn. continues to lead with the highest membership of 582 and the Central States Assn. is second with 556 members.

Committee Chairmen

R. W. Moir
Cons. Engr.
Auburndale
Mass.
(Inspection Trip)

R. W. Horne
Cons. Engr.
Boston
Mass.
(Transportation)

Board Actions

In addition to receiving the usual committee reports, voting awards, and conducting routine business, the Board of Directors took action on certain suggestions of considerable interest to all members of the Federation.

First in importance was the decision to change the name of *Sewage Works Journal* with the beginning of monthly publication in January. The new name will be *Sewage and Industrial Wastes,* The Journal of the Federation of Sewage Works Assns.

The Board also voted to request the Constitutional Committee to prepare a constitutional amendment changing the name of the Federation to the "Federation of Sewage and Industrial Wastes Assns.", or any other name which will designate that the Federation is devoted to not only sewage treatment but also to industrial waste treatment. The amendment is to be submitted to the various directors of member associations in accordance with the provisions of the constitution.

During the discussion which took place in regard to the change in

John W. Hood
Supt.
Sew. Tr. Plt.
Ridgewood, N.J.
(Eddy Research Award)

Wilbur N. Torpey
San. Engr.
Dept. Pub. Wks.
New York City
(Gascoigne Operation Award)

Geo. S. Russell
Pres.
Russell & Axon
St. Louis, Mo.
(Past President's Certificate)

Geo. W. Martin
Supt.
Metro. Sew. Dist.
Green Bay, Wis.

R. D. Craun
Supt.
Sew. Tr. Plt.
Rochester, Mich.

Honors and Awards
(Hatfield Awards for Annual Reports)

H. P. Croft
Ch. Engr.
N.J. Dept. H'lth
Trenton, N.J.
(Bedell Award for N. J.)

name, it was brought out that five associations already have changed their names to include the words "Industrial Waste," and two more are contemplating an early change in the same manner. The number of pages of the *Journal* devoted to industrial waste indicates the growing interest in this phase of waste treatment and pollution abatement. In 1946 the number of papers on sewage treatment was 35 per cent of the total while the industrial waste articles constituted 14 per cent of the total. In 1947 these figures were 24 and 24. In 1948 these figures were 27 and 39 respectively. This trend has continued in 1949.

Another action of the Board was also adopted as evidence of the fact that the Federation is vitally interested in industrial wastes, and that the Federation is the logical organization to which industrial waste engineers should bring their problems. This action was the creation of a new award to be known as the "F.S.W.A. Industrial Wastes Award." The award is to be made for the most important paper on the subject of industrial waste published by a bonafide employee of an industry. The award may not be won by consultants, or others not employed by industry but working on industrial waste problems. Rules for the competition will be the same as those for the Eddy and Gascoigne Awards.

The next Manual of Sewage Practice to be issued will be that on Chlorination of Sewage. The 20-year index of *Sewage Works Journal* will be published before mid-1950.

The Board decided to accept the invitation of the N.Y.S.S.W.A. to hold the 25th silver anniversary meeting in New York City in October, 1952. The 1950 meeting will be held in Washington, D.C., and the 1951 meeting in St. Paul, Minn. Invitations were also received for future meetings in Florida, Texas, and Canada.

The Board also voted to have the Secretary confer with representatives of A.P.H.A., A.W.W.A., and A.S.T.M. in regard to the work of the latter on standard methods for analysis of industrial wastes. It was resolved that the Federation should go on record as being opposed to the Crookes bill in Congress. This bill would change Public Law 845 to the extent that it would take away from the States their control of stream pollution and lodge such control entirely within the U.S.P.H.S.

The Board adopted a budget of $75,500 for the year 1950. This is an increase of $23,000 over the 1949 budget, most of which is occasioned by the increase in the publication schedule for the *Journal* from six to twelve issues a year. Part of the money to defray this increased cost of operation will come from increased dues to the Federation and the remainder will come from increased advertising revenues.

Federation Luncheon

The annual luncheon held on Tuesday noon was attended by more than 350 persons including about half of the members of the Quarter Century Club. Latest additions to this club were George S. Long, presently an engineer at the sewage treatment works at Akron, Ohio, who operated the Penn State plant in 1915-16, and from Wm. B. Gyatt, who has been responsible for the operation of the Syracuse plant since 1924. The Secretary of the Club, F. W. Jones, announced the death of one of the charter members, Almon L. Fales, until recently a member of the firm of Metcalf and Eddy.

Speaker at the annual luncheon was Gordon M. Fair, Dean, Graduate School of Engineering, Harvard University, Cambridge, Mass. Dean Fair spoke on "Sanitary Engineering in a Changing World." Taking his audience back a hundred years to the time when Lemuel Shattuck wrote his famous and prophetic report, Dean Fair reviewed the advances in sanitary engineering in the past century with particular reference to the part played by the Lawrence Experiment Station, and such famous men as Sedgwick, Hazen, Fuller, E. O. Jordan, and Harry W. Clark, all of whom were the direct products of the work Shattuck stimulated in his report on Public Health for the State of Massachusetts.

In 100 years, sanitary engineers have done many things toward the accomplishment of public health objectives. A dramatic example of these accomplishments is evidenced in the drop in typhoid fever deaths from 30 per 100,000 early in this century to 0.05 per 100,000 in 1949. Had not this been accomplished we could have expected 50,000 deaths a year at the present time. As far as public health is concerned, the sanitary engineer is the low man on the totem pole according to Dean Fair.

W. F. Shephard
San. Engr.
State H'lth Dept.
Lansing, Mich.
(Michigan)

W. A. Sperry
Supt.
San. District
Aurora, Ill.
(Cent. States)

R. P. Farrell
Ch. San. Engr.
St. H'lth Dept.
Nashville, Tenn.
(Ky.-Tenn.)

A. S. Bedell Awards

(F. L. McDonald, Ark.; H. W. Streeter, Fed.; W. M. Piatt, N. Car.; C. E. Green, Pac. N.W., and V. M. Ehlers, Tex., also received Bedell Awards)

Important Committee Reports

F. W. Mohlman
Dir. of Labs.
San. District
Chicago
Ill.
(Indust. Waste)

Earnest Boyce
Head
Civ. Engr. Dept.
Univ. of Mich.
Ann. Arbor, Mich.
(Constitution)

New Dir.-at-Large

R. H. Gould
Director
Bur. Sew. Disp.
Dept. Pub. Wks.
New York City

Luncheon Speaker

Gordon M. Fair
Dean
Grad. School
Harvard Univ.
Cambridge, Mass

Looking toward the future, Dean Fair said that the sanitary engineer and his associates had definitely not worked themselves out of a job. There is still a need for 6000 water supplies and 8000 sewage treatment plants in this country and many rural areas that need modern sanitation. In addition, under Public Law 845 there is the vast program of stream pollution abatement including industrial waste treatment.

"Sanitary engineering is America's gift to the world," and the promotion of public health covers or touches upon every profession and every person in the world.

New Jersey and New England Dinners

One of the unusual dinners held at the meeting was that held by the New Jersey Sewage Works Assn. More than fifty members of the N.J. Assn. were registered and 76 persons attended the dinner held in honor of the three members of the N.J. Assn. who received awards from the Federation. These were Messrs. Croft (Bedell Award), Hood (Eddy Award), and Orchard (Emerson Award). At the dinner, attention was called to the fact that out of five Eddy awards, three had been awarded to members of the N.J. Assn.

On the same evening the New England Sewage Works Assn. held its annual dinner. This meeting was attended by more than 150 persons.

Inspection Trip

The inspection trip was divided into two parts. Nearly four hundred persons took the trips. Part of them visited the William T. Sedgwick Laboratories of Sanitary Science at Mass. Institute of Technology, Cambridge, Mass. Part of them visited the Nut Island Sewage Treatment Works of the Mass. Metrop. Dist. Comm. All of them visited the Industrial Waste Treatment Plant of Proctor and Gamble Mfg. Co.

The Nut Island plant is designed for a flow of 112 mgd. with a maximum storm flow of 300 to 350 mgd. Present flow is 95 mgd. Population to be served when the plant is completed will be 900,000. At 0.2 lb. of suspended solids per capita per day, the expected solids to be removed and handled is 90,000 lb. per day.

The sewage will pass through comminutors, fine racks, aeration channels for preaeration, sedimentation tanks with 88 min. detention at average design flow. Sludge will be digested in four tanks, two with fixed covers and two with floating covers. The former will be the first stage, and the latter the second stage. Gas production is expected to be from 525,000 to 625,000 cu. ft. per day.

Digested sludge will be discharged through a submarine outlet into a deep water channel in the harbor. This treatment is expected to remove the sewage slick heretofore evident in the harbor. The plant has only progressed to the stage of completion of the concrete work although practically all mechanical equipment has been purchased and is stored in warehouses at the present time. Full completion of the plant is expected in another 1½ years.

The industrial waste treatment plant at the Proctor and Gamble Mfg. Co. is a Gibbs Unit operating on fatty acid wastes from the manufacture of soaps. This process utilizes controlled neutralization of the fatty acid wastes, and aeration of the wastes with a continuous skimming of the grease and fats from the surface of the unit while the clarified effluent is discharged over a weir to the bay without any nuisance.

Inspection Trip to Nut Island

Karl Kennison, Chief Engr. of Construction, explains plans for completing plant—Left, by loud speaker from police car; Right, to a smaller group.

Boston's Sewage Problems

"PROGRESS IN SOLVING THE SEWAGE POLLUTION PROBLEMS OF THE MASS. METROP. DIST." by Karl R. Kennison, Chief Engr., Construction Div., Metrop. Dist. Comm. of the Commonwealth of Massachusetts, Boston, Mass.

Mr. Kennison presented an illustrated talk on the problems of sewage treatment and disposal at Boston, including the metropolitan district. There are three areas, two of which are handled by the Metropolitan Dis-

Inspection Trip

Left—Visitors view old steam-operated screen—Right—F.S.W.A. President Niles talks with Tom Henry of Toledo, Dave Gallagher of Worthington Pump, and others.

trict and one by the City of Boston. The basis of design of the Nut Island Treatment works was given as reported under the Inspection Trip above.

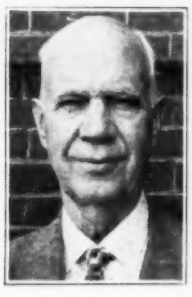
"SEWAGE TREATMENT AND DISPOSAL FOR BOSTON" by Robt. P. Shea, Div. Engr., Sewer Div., Public Works Dept., Boston, Mass.

In the absence of Mr. Shea, the paper was presented by Mr. Flattery, Sr. Civil Engineer of the Dept. This paper was also illustrated with slides showing the main drainage area of the city proper and the interceptor lines and sewers that are a part of the system.

Karl Kennison
Ch. Engr.
Const. Div.
Met. Dist. Comm.
Boston, Mass.

Abel Wolman
Prof. San. Engr.
Johns Hopkins U.
Baltimore, Md.

H. W. Gehm
Tech. Dir.
Nat. Council
Pulp & Paper Bd.
New York City



R. G. Tyler
Prof. San. Engr.
Univ. of Wash.
Seattle, Wash.

Programmers

Natural Water Standards

"BACTERIAL STANDARDS FOR NATURAL WATERS" by Abel Wolman, Prof. of San. Engineering, Johns Hopkins University, Baltimore, Md.

Dr. Wolman asked if quality of water required standards, and if so what should they be. It is essential that one distinguish between standards for analytical methods, which are the tools for uniformity, and standards of judgment.

Dr. Wolman pointed to the warnings of history that standards are dangerous, and stated that Sedgwick had said many years ago that standards are the work of one worker "seized upon until they become standards with a semblance of authority." The appeal of handbooks has become overpowering, and standards are the refuge of the lazy worker.

Dr. Wolman called for taking stock of the situation in order that no more effort and expense be spent on sewage treatment than is necessary because of the present high costs of facilities.

The manner in which data are seized upon and made to appear to be standards was explained with the example of the Report of the Ohio River Pollution Survey which stated that it is "unwise to establish rigid standards." The famous Table VII is the case in point. Whereas the report pointed out that standards must be fitted to the conditions, Table VII has since been quoted many times as standards.

Standards for bathing waters vary widely in this country, and in one state alone there are five standards, in another four, and in others three, two, one, and none. Standards vary from 5 to 2500 coliform bacteria per 100 ml.

Not only is there a wide variation but, in several instances, the Committee of State Sanitary Engineers has used interchangeably the Phelps Index and the M.P.N. of coliform bacteria. Thus, standards not only vary but become quite confusing.

Furthermore, according to Dr. Wolman, there has been no epidemiological basis found for setting these bacterial standards. To add to the confusion, there are higher death rates of bacteria in salt water.

Dr. Wolman called for action by the Federation to study this problem and evaluate results and appraise not only the need for but also the standards themselves.

Discussion of this paper was presented by **A. H. Stevenson,** Sr. San. Engr., Executive Officer, Environmental Health Center, U.S.P.H.S., Cincinnati, Ohio.

Mr. Stevenson suggested that the word *standard* was a misnomer, indicating an inflexibility not desired. He prefers the word *guides*. Legal adoption of standards or guides adds to the inflexibility. Admitting that standards for bathing water need better data, Mr. Stevenson said that the U.S.P.H.S. has two programs under way toward this end. One of these studies has been made in Lake Michigan, where the attempt has been made to correlate incidence of disease among bathers with water quality of the bathing beaches. Similar studies are being made at Dayton, Ohio, and Belleview, Ky. When these studies are completed they may furnish a control basis.

The second study has been concerned with shellfish sanitation studies, using both Coliform and

Ladies' Entertainment Trips

At left—Mrs. T. A. Berrigan, Chairman of Ladies' Entertainment Committee. Among those we recognize are Mrs. E. Sherman Chase, Boston; Mrs. Clyde C. Kennedy, San Francisco; Mrs. L. H. Enslow, New York City; Mrs. W. D. Hatfield, Decatur, Ill.; Mrs. A. H. Niles, Toledo.

Inspection Trip—Gibbs Unit—P. & G. Plant

Left—Earnest Boyce, Univ. of Mich.; Gladys Swope, Argonne Lab., and friend
Center—The Gibbs Unit removing fatty acid wastes
Right—Frank Roe, Carborundum Co., Designer and Developer Fred Gibbs, and R. W. Hess, Waste Supervisor, National Aniline Co., Buffalo, N.Y.

Mfrs.' Assn. Brass

Vice Pres.	Secy.-Mgr.
Reg. F. Hayes	*A. T. Clark*
Vice Pres.	*Secy.*
Hyd. Dev. Co.	*W.S.W.M.A.*
New York City	*New York City*

Host Association

President	Secretary
W. H. Brown	*W. E. Merrill*
Supt.	*San. Engr.*
Sew. Tr. Plt.	*State H'lth Dept.*
Cranston, R. I.	*Boston, Mass.*

Programmers

Stream Pollution Sampling

C. J. Velz	F. W. Kittrell
Prof.	*Chief*
Pub. H'lth Sch.	*Str. San. Sect.*
Univ. of Mich.	*T.V.A.*
Ann Arbor, Mich.	*Knoxville, Tenn.*

Enterococcus bacteria. From the results of these studies, it appears that Enterococcus bacteria will provide better evidence of recent pollution than Coliform bacteria.

Mr. Stevenson closed his talk with the argument that standards fill an administrative need for control agencies, and where these standards apply to fringe cases, one must apply judgment.

The average D.O. was down to less than 0.2 ppm. but the production of H_2S was less than 0.01 ppm. Among the tests run as a means of control of the stream were permanganate oxygen consumed, hot and cold, as well as the various forms of nitrogen and B.O.D.

Discussion by **Harry W. Gehm,** Technical Director, National Council for Stream Improvement of the Pulp, Paper, and Paperboard Industries, Inc., New York City.

Dr. Gehm reviewed the history of this problem and told how a combination of control of process, a change from sulfite to Kraft Mill Process and lagooning the sulfite liquor at one plant were all utilized to reduce the pollution load on the stream. Even so there is still the problem of H_2S formation at times of low stream flow, and this is complicated by flow control for power development. Dr. Gehm admitted that the conditions necessary for the formation were several and that it is impossible to control them all at once. Thus it is likely that nitrate will continue to be used since it has been proved to be effective.

Some of the 142 Ladies Present

Reading from left to right: Mrs. Walter E. Merrill, Boston; Mrs. Walter H. Brown, Cranston, R.I.; Mrs. Stuart Coburn, Boston; Mrs. Tom R. Camp, Boston; Mrs. W. D. Hatfield, Decatur, Ill.; Mrs. R. W. Ockershausen.

Sodium Nitrate for Stream Pollution

"Application of Sodium Nitrate to the Androscoggin River" by Walter A. Lawrance, Prof. of Chemistry, Bates College, Lewiston, Me.

Because of the extreme odor condition along the Androscoggin River and the nuisance caused at two municipalities, a legal administrator has been appointed with power to control the operation of the three paper mills causing the trouble. One of the things which the administrator can do is to add sodium nitrate to the river.

It has been found that from 1 to 2 ppm. of $NaNO_3$ is sufficient to hold down the production of hydrogen sulfide. From 600 to 700 lb. of nitrate were added during the past summer.

Stream Sampling

"Sampling for Effective Evaluation of Stream Pollution" by Clarence J. Velz, Prof. and Chair., Dept. of Public Health Statistics, School of Public Health, Univ. of Mich., Ann Arbor, Mich.

Prof. Velz opened by stating that it is possible to compute conditions of a stream for one set of factors, if the conditions are known for another set of factors. It is only necessary to know the hydrologic factors, the sources of pollution, and to have good sampling on which analyses are based.

In order to establish the conditions of a stream, it is necessary to have proper cross-sectional sampling. It is not necessary to have exact measurements of the distances between sampling stations but they should be approximate. Integration of loads and time of flow is essential.

It is also essential to have data on the primary sources of pollution. This is best obtained by on-shore surveys of domestic and industrial wastes. It is not possible to determine the B.O.D. of the stream to determine the load and its effect, too. Only the on-shore survey will determine the load.

Proper sampling and proper determinations are also essential to evaluation of stream pollution data. Investigators should remember that rivers are dynamic entities, not static, and therefore it is necessary to have a flexible sampling program. It is better to have a few locations with sufficient sampling than a large

Bus Ride to Historic Boston Shrines

From left to right: Mrs. R. H. Calihan, Dayton, Ohio; Mrs. Lloyd C. Huffman, Dayton, Ohio; Mrs. J. J. Gilbert, Philadelphia; Mrs. R. F. Coltart, Philadelphia; Mrs. A. E. Franzozo, Manville, N.J.; Mrs. A. Palmer, Dunellen, N.J.; Mrs. R. S. Rankin, New York City; Mrs. L. W. Van Kleeck, Hartford, Conn.; Ida B. Swab and Blanche Swab, Toledo, Ohio; Mrs. Wm. S. Wise, Hartford, Conn.

number of locations and few samples at each. It is better to have more samples during one stable river regimen than grab samples at many points and under many conditions.

Prof. Velz talked about the problems of tributary pools, depths, flashy streams and mentioned the four factors which affect stream conditions, including immediate oxygen demand, sludge deposits, biological effects of sludge beds, and algae growths.

Prof. Velz concluded his paper with a discussion of sampling during tidal variations in estuaries. Such factors as land water runoff, salinity gradient, and tidal variations must be taken into consideration. It is essential that one differentiate between high and load tides, phases of the moon.

There are no short cuts to stream pollution studies. By taking at least 16 samples over a two-hour period, and applying statistical approach to sampling affords maximum results at a minimum cost and effort.

Discussion by **Robt. N. Clark,** Chief Public Health Engr., Tennessee Valley Authority, Chattanooga, Tenn. In the absence of Mr. Clark, the paper was presented by **F. W. Kittrell,** Chief, Stream Sanitation Section, T.V.A., Knoxville, Tenn.

In studying stream data, it is necessary to evaluate the limit of accuracy of the data. Inapplicable data must be thrown out, and there must be sufficient data to support the conclusions.

The T.V.A. has been studying bacterial death rates and has found that the coliform bacteria determination is the most sensitive test to determine the presence of domestic pollution. In one instance it was possible to locate the pollution load from 400 persons in a stream flow of 27,000 cfs.

The T.V.A. also has developed a means for studying prisms of stream flow. Single observations are worthless, but following a prism of water gives the answer to pollution load, self purification, dilution, tributaries, etc. This method of sampling was developed by studying the conductivity pattern for 24 hours at two stations on the stream.

Sewage in Tidal Waters

"Problems Relating to the Disposition of Sewage into Tidal Waters," by R. G. Tyler, Prof. of San. Engineering, Univ. of Washington, Seattle, Wash.

Prof. Tyler showed slides to illustrate the variations in tides and the effects of these tides on the pollution of the tidal basin. Although there is plenty of dissolved oxygen and a dilution of 200 to 1, the bacterial pollution is a problem.

Studies of a model showed that 85 per cent of the pollution remains in the tidal basin during the tide fluctuations. A study of the estuary itself by making determination of the chloride content and finally by using the S.T.D. apparatus showed that only 1.2 per cent of the water in the basin is exchanged during each tide. The waste lies in the harbor for eighty tide cycles or 42 days. From these studies it is possible to determine the pollution buildup in the harbor.

The name S.T.D. device is short for Saline-Temperature-Density and the apparatus which costs $3000 was developed by the Navy. Only three are now in existence, one of which is used by the Woods Hole Laboratories. This device makes it possible to study pollution in tidal waters easily and cheaply.

Discussion by **R. H. Gould,** Director, Div. of Sewage Disposal, Dept. of Public Works, New York City. Mr. Gould, too, showed slides of conditions in New York Harbor, and the heavy underruns which occur in the Hudson River. The effects of these tidal exchanges on pollution in the harbor was explained and it was obvious that somewhat similar conditions obtain here to those described by Prof. Tyler. Pollution buildup is a problem.

(The second installment of this report on the Federation meeting will appear in the next issue.)

K. S. Watson Asst. Dir. Ohio River Compact Comm.

Appointment of Kenneth S. Watson of Charleston, West Virginia, as Asst. Director of the Ohio River Compact Commission has been announced by J. L. Quinn, Chairman of the Commission. Mr. Watson, a registered professional engineer, has been administrative head and executive secretary of the West Virginia Water Commission since 1946. He has also served as one of the three representatives from West Virginia on the board of the Ohio River Compact Commission.

A graduate of West Virginia University, Mr. Watson served as a major in the U. S. Corps of Engineers during the war. He is active in the Federation of Sewage Works Associations.

Cost of Operating New York's Dep't of Water Supply, Gas and Electricity Up 40 Per Cent

The 1949-50 budget for operating the Dep't of Water Supply, Gas and Electricity of New York City is $24,245,018.00, representing an increase of 40 per cent over the cost of operating the Department five years ago.

The major expenditure by the Department is for the operation of the City's water supply system. The following are the operating costs which have been recorded since 1945, revealing an increase over the five year period of almost $7,000,000 per year, representing a 40 per cent increase.

1945-46	$17,323,889
1946-47	19,276,586
1947-48	20,699,034
1948-49	23,343,505
1949-50	24,245,018

Dr. Setter Principal Chemist U.S.P.H.S. Cincinnati

Announcement has been made of the appointment of Dr. Lloyd R. Setter, as Principal Chemist, Physics and Chemistry Sect., Environmental Health Center, U.S.P.H.S., Cincinnati, Ohio. Dr. Setter was formerly sanitary engineer in the Public Health Engineering Section of the Tennessee Valley Authority. Prior to that he had been associated with the Dept. of Public Works of New York City, and at one time was on the staff of New York University.

WORLD'S LARGEST WATER SOFTENING PLANT

So. Calif. Metropolitan Water District Doubles Plant Capacity

by

WILLIAM W. AULTMAN

Water Purification Engineer

METROPOLITAN WATER DIST. OF SO. CALIF.

LA VERNE, CALIF.

TO satisfy the growing need for water in southern California, the demand upon the Colorado River Aqueduct of the Metropolitan Water Dist. of Southern California has been steadily and rapidly increasing since the system was first put into operation in 1941. As a result, the District's water softening and filtration plant, located about 30 miles east of Los Angeles near La Verne, has been taxed beyond its capacity in recent dry summers.

The Author

Enlargement Plans

This overloaded condition was alleviated on August 31st, when the 100 mgd. addition to the existing plant was completed, thereby doubling the capacity of the softening and filtration plant. Since its construction in 1941, the plant has had the largest zeolite softening facilities in the world, but the completion of this addition will, it is believed, make this the largest treatment plant of any type designed primarily for softening water.

The enlargement of the plant was started in February, 1948, when the L. E. Dixon Co. of San Gabriel, Calif., began work on their $2,592,400 construction contract. The major equipment for the new plant was purchased by the District and furnished to the general contractor, so the total cost of the plant addition, including design and engineering, will be approximately $4,000,000.

The original 100 mgd. plant, built in 1940-41 at a cost of $3,000,000, was designed to be enlarged to an ultimate capacity of 400 mgd. The main water channels, head house and administration building were all built to ultimate capacity. At the time of the original construction it was estimated that this first 100 mgd. addition to the plant would cost less than $2,000,000, but current prices will make it cost twice that amount.

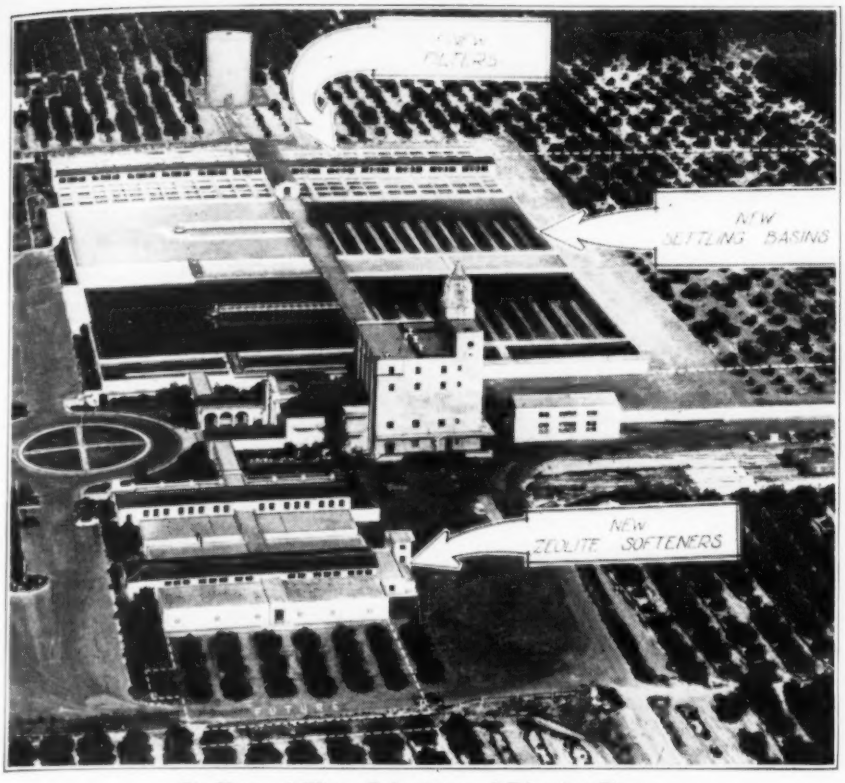
The original plant has been thoroughly described heretofore [1,2,3], so only the salient features of the new plant which differ from the old will be discussed.

New Features

Starting in the direction of flow of the water, the first new structures are the mixing basins. These are practically identical in design to the old basins except that one additional baffle is provided and the entrance to the settling basins consists of a submerged weir the full length of the basin. The flocculator paddles are on horizontal shafts with a center dry-well drive, and with the flow of water parallel to the shaft. A 30-minute detention period is provided in the mixing basins at rated plant capacity. The equipment was furnished by the Link-Belt Co.

The major change in design was made in the settling basins. These basins are changed from the existing center feed-well type of unit to a double-deck, cross-flow type of unit in which the water enters the lower deck, travels the entire length of the basin and returns on the upper deck

Looking South to Head House Across Filters and Settling Basins
(New construction is to left of walkway)



Air View of Water Softening and Filtration Plant
(New extensions and ultimate future developments are indicated)

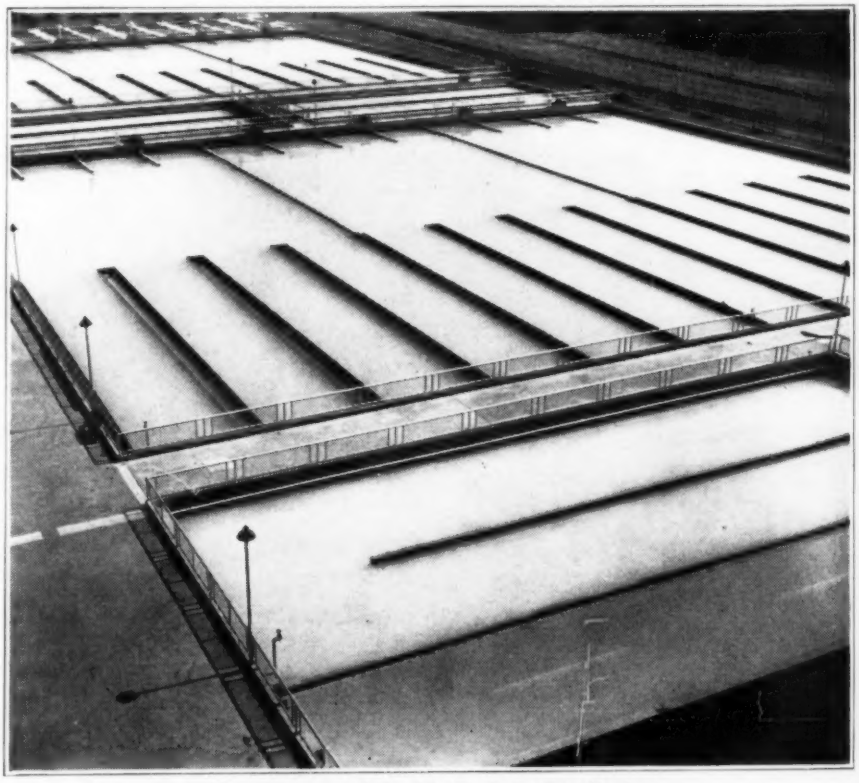
to long finger troughs where it is collected. Both the new and the old basins are 200 feet square. The new basins use Link-Belt Straight-Line sludge scrapers. One pertinent feature of the new basins is that the sludge removal mechanism travels in the same direction and at approximately the same speed as the water passing through the basins, and the same mechanism scrapes both the top and the bottom decks. Another feature of this design is that the weir overflow rate is lowered from 65,100 gal. per day per foot of weir in the original plant to 25,400 gal. per day per foot of weir in the plant addition. The detention time in the basins of both the old and the new plants is two hours at rated capacity. It is believed that these changes in design will produce a better quality of water going onto the filters.

The new rapid sand filters are identical in design to the original filters. Twelve new filter units are included, each with a sand area of 1,930 sq. ft., providing rated plant capacity when operating at 3 gpm. per square foot of sand area. Each filter contains 24-in. of gravel and 24-in. of sand. The effective size of the sand is 0.45 to 0.50 millimeters with a uniformity coefficient of less than 1.65. The rate-of-flow controllers are supplied by Builders-Pacific, using air-actuated gauges. To decrease maintenance of the hydraulic valve, operating cylinders, a return line and sump are provided on the hydro-pneumatic system to permit special treatment of this water supply.

New Zeolite Softeners

The twelve new zeolite softeners will operate upflow as before at a rate of 6 to 8 gpm. per square foot, with the downflow regeneration process functioning automatically after manual actuation. The automatic regenerating control equipment is supplied by the Permutit Co. The appearance of the new zeolite pipe gallery is materially different than the old, because the concrete influent channel in the new unit has been raised to hydraulic gradient rather than being operated as a pressure conduit. This is done primarily to permit access to the softener influent valves for maintenance without a complete plant shut-down. Because of raising this influent channel, the individual softener units are necessarily raised about two feet but this additional height does not provide additional zeolite capacity. The softener units, however, have been deepened to permit the installation of additional zeolite and still provide the required 100 per cent freeboard between the top of the zeolite and the top of the troughs.

In the new zeolite plant provision is made so that two softeners may be regenerated simultaneously, one on each side of the building. Only one unit can be brined at a time in the existing plant. A four-foot depth of zeolite is installed in each new softener unit, or 2,520 cu. ft. each, as compared to 3½ feet of zeolite or 2,205 cu. ft. each in the original plant. This provides a total of 30,240 cu. ft. of zeolite in the 12 new units and 56,700 cu. ft. for the entire plant. The in-



New Mixing and Double Deck Settling Basins
(Flocculation basin in foreground, filters in rear)

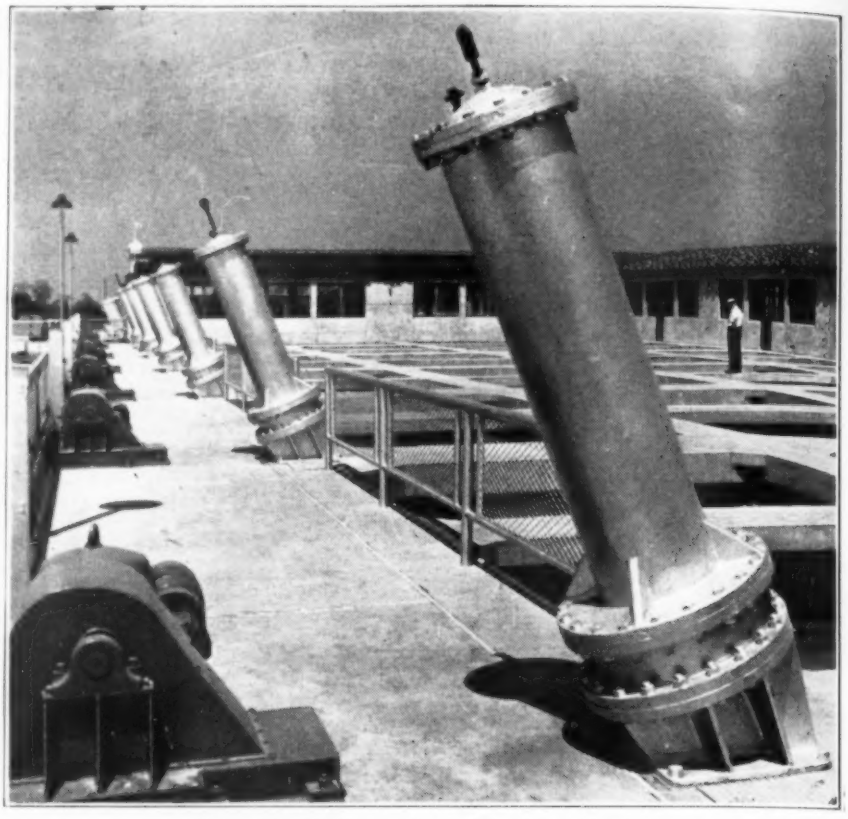
creased zeolite capacity of the new plant and the new regeneration procedure will permit more continuous full-scale operation of the zeolite units.

Synthetic Zeolite

The zeolite for the new plant is a synthetic gel-type siliceous cation exchanger manufactured by the National Aluminate Corp. The cost of this material in place in the units is in excess of $210,000. Extensive research has been done by the District on all types of cation exchangers operating on the sodium cycle. As a result, one softener unit in the original plant has been filled with a polystyrene base resinous exchanger and the operating results have been most satisfactory. The type of cation exchanger to be used for future zeolite replacements will be determined from the long-time operating results obtained on the two types of materials.

Zeolite Regeneration

The salt used by the District is mined on the desert and contains from one to two per cent water insoluble matter. As a result of occasional difficulty in the past with turbid brine from the pressure filters, the brine filters in the new plant are rapid sand gravity units which are operated from the new zeolite control room. Three gravity brine filters are provided, each with 50 sq. ft. of sand area, designed to operate at a 2 gpm. per sq. ft. rate. Storage capacity of 15,000 gal. is provided under the filters for filtered saturated brine.



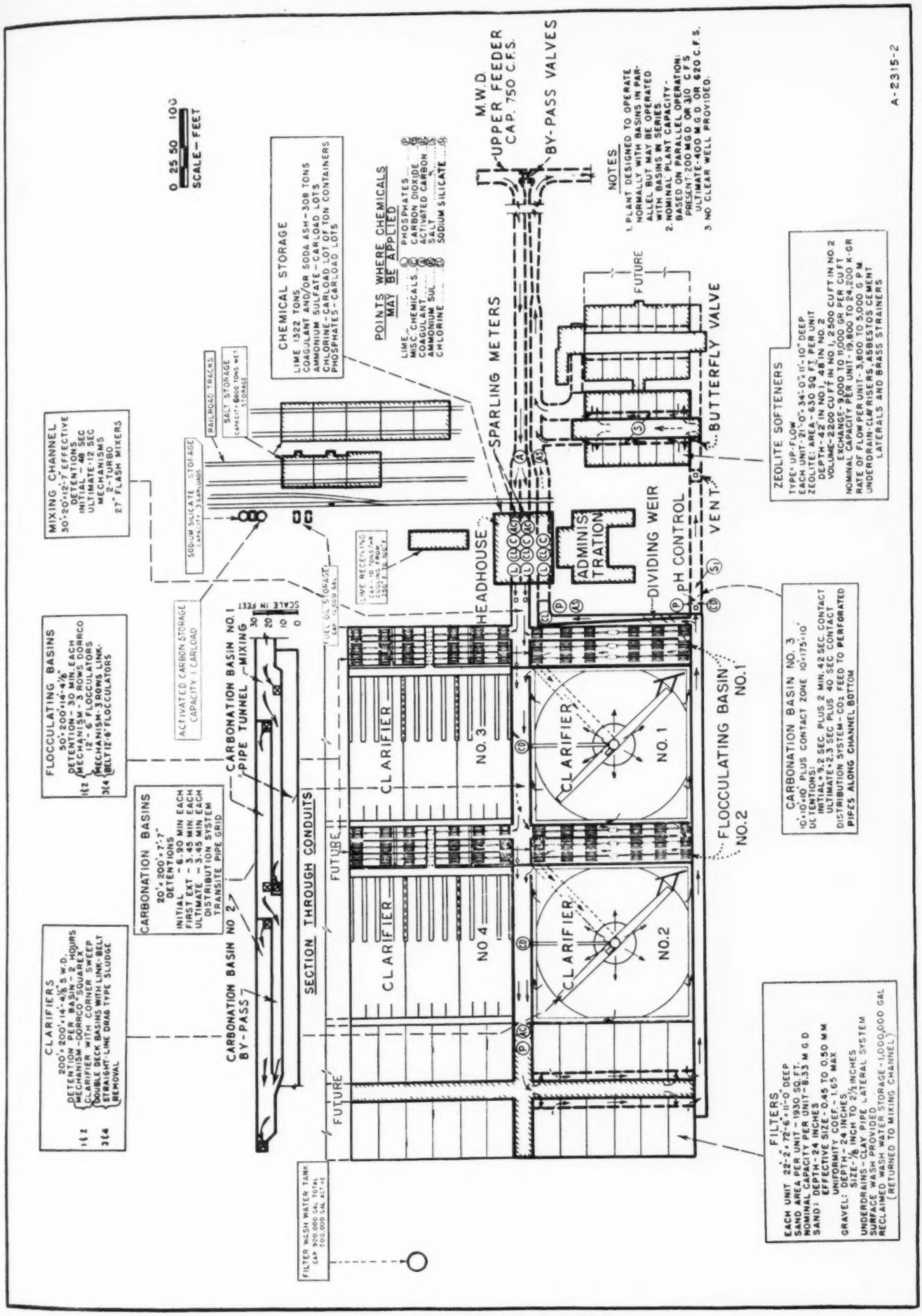
Filters with Hydraulic Valve Operating Cylinders

Salt is received by the District in open, gondola railway cars which are dumped into storage basins beneath the railroad tracks where the salt is stored wet. The saturated brine from these storage basins is pumped to the brine filters in the zeolite softener building. Five additional salt storage basins have been constructed for the new plant. These basins provide storage capacity for 3,750 tons of salt. With the existing basins a total of 6,000 tons of salt may be in storage at one time. During the past fiscal year while operating the 100 mgd. plant, over 50,000 tons of salt were used by the District at the softening plant. When the new plant is operated at capacity, a total of 6 cars of salt will be required per day.

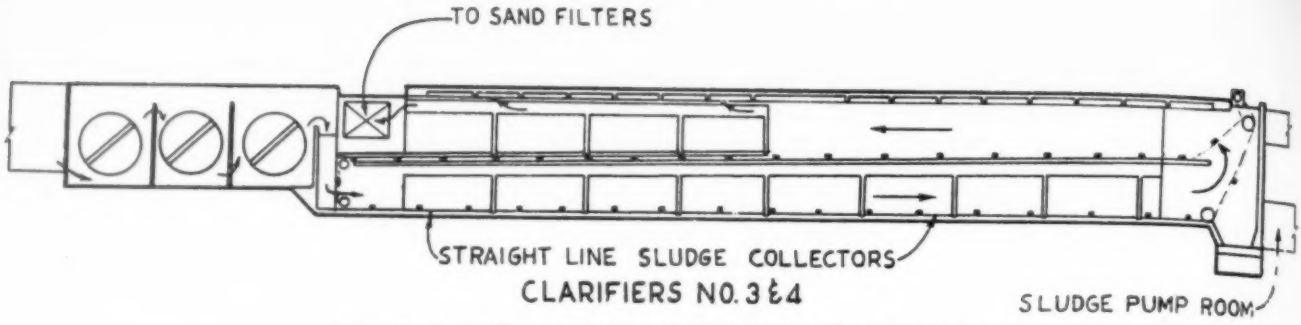
Interior of Filter Operating Gallery

pH Adjustment

Another feature of the new plant is the inclusion of two Omega lime feeders and slakers in the zeolite building for pH correction of the finished water. The method of operation at the softening plant is to partially lime-soften and filter all the water entering the plant. A portion of this lime-softened and filtered water—about two-thirds—is further softened to zero hardness through zeolite. This zeolite-softened water is then mixed with the by-passed water to obtain the desired finished water hardness. The lime for pH correction of the finished water in the present plant is being added in the by-pass channel, sufficient lime being added to raise the pH of the final blend with the zeolite water to the desired point to prevent corrosion. The by-passed water is not softened as far as possible with lime due to the necessity of maintaining a relatively high alkalinity, so the addition of lime for pH correction tends to further soften this water. As a


0 25 50 100
SCALE – FEET
A-2315-2
M.W.D. UPPER FEEDER CAP. 750 C.F.S.
BY-PASS VALVES
SPARLING METERS
BUTTERFLY VALVE
VENT
NOTES
1. PLANT DESIGNED TO OPERATE NORMALLY WITH BASINS IN PARALLEL BUT MAY BE OPERATED WITH BASINS IN SERIES.
2. NOMINAL PLANT CAPACITY - BASED ON PARALLEL OPERATION: PRESENT 200 M G D OR 310 C F S ULTIMATE 400 M G D OR 620 C.F.S.
3. NO CLEAR WELL PROVIDED.
CHEMICAL STORAGE
LIME 1322 TONS
COAGULANT AND/OR SODA ASH – 3081 TONS
AMMONIUM SULFATE – CARLOAD LOTS
CHLORINE – CARLOAD LOT OF TON CONTAINERS
PHOSPHATES – CARLOAD LOTS
POINTS WHERE CHEMICALS MAY BE APPLIED
LIME
MISC. CHEMICALS
COAGULANT
AMMONIUM SUL.
CHLORINE
PHOSPHATES
CARBON DIOXIDE
ACTIVATED CARBON
SALT
SODIUM SILICATE
RAILROAD TRACKS
SALT STORAGE
SODIUM SILICATE STORAGE
MIXING CHANNEL
30'-20'-12'-7" EFFECTIVE DETENTIONS
INITIAL – 48 SEC
ULTIMATE-12 SEC
MECHANISMS
2-TURBO
27" FLASH MIXERS
FLOCCULATING BASINS
50'-200'-14'-4½"
DETENTION – 30 MIN. EACH
MECHANISM – 3 ROWS DORRCO
12'-6" FLOCCULATORS
MECHANISM – 3 ROWS LINK-BELT
12'-6" FLOCCULATORS
ACTIVATED CARBON STORAGE
CAPACITY 1 CARLOAD
CARBONATION BASINS
20'-200'-7'-7"
DETENTIONS
INITIAL – 6.90 MIN EACH
FIRST EXT – 3.45 MIN EACH
ULTIMATE – 3.45 MIN EACH
DISTRIBUTION SYSTEM
TRANSITE PIPE GRID
CLARIFIERS
200'-200'-14'-4½" S.W.D.
DETENTION PER BASIN – 2 HOURS
MECHANISM – DORRCO "SQUAREX"
CLARIFIER WITH CORNER SWEEP
DOUBLE DECK BASINS WITH LINK-BELT STRAIGHT-LINE DRAG TYPE SLUDGE REMOVAL
CARBONATION BASIN NO 2
BY-PASS
CARBONATION BASIN NO. 1
MIXING
PIPE TUNNEL
SECTION THROUGH CONDUITS
FUTURE
FUTURE
CLARIFIER NO. 3
CLARIFIER NO. 4
CLARIFIER NO. 1
CLARIFIER NO. 2
FLOCCULATING BASIN NO. 1
FLOCCULATING BASIN NO. 2
HEADHOUSE
ADMINISTRATION
DIVIDING WEIR
pH CONTROL
FUTURE
CARBONATION BASIN NO. 3
10'-10'-10' PLUS CONTACT ZONE 10'-175-10'
DETENTIONS:
INITIAL – 2 SEC. PLUS 2 MIN. 42 SEC. CONTACT
ULTIMATE – 2.3 SEC. PLUS 40 SEC. CONTACT
DISTRIBUTION SYSTEM – CO2 FEED TO PERFORATED PIPES ALONG CHANNEL BOTTOM
ZEOLITE SOFTENERS
TYPE UP-FLOW
EACH UNIT – 21'-0"x34'-0"x11'-10" DEEP
ZEOLITE: AREA – 630 SQ FT. PER UNIT
DEPTH – 42" IN NO. 1 AND NO. 2
VOLUME – 2200 CU FT IN NO. 1, 2520 CU FT IN NO. 2
FREEBOARD – 6'-0" IN NO. 1, 2500 CU FT
NOMINAL CAPACITY PER UNIT – 19,800 TO 24,200 K-GR
RATE OF FLOW PER UNIT – 3,800 TO 5,000 G P M
UNDERDRAIN: CLAY RISERS, ASBESTOS CEMENT LATERALS AND BRASS STRAINERS
FILTERS
EACH UNIT 22'-2"x72'-6"x11'-0" DEEP
SAND AREA PER UNIT – 1930 SQ.FT.
NOMINAL CAPACITY PER UNIT – 8.33 M G D
SAND: DEPTH – 24 INCHES
EFFECTIVE SIZE – 0.45 TO 0.50 MM
UNIFORMITY COEF. – 1.65 MAX
GRAVEL: DEPTH – 24 INCHES
SIZE – ⅛ INCH TO 2½ INCHES
UNDERDRAINS – CLAY PIPE LATERAL SYSTEM
SURFACE WASH PROVIDED
RECLAIMED WASH WATER STORAGE – 1,000,000 GAL (RETURNED TO MIXING CHANNEL)
FILTER WASH WATER TANK
CAP. 300,000 GAL TOTAL
200,000 GAL ELEVATED

General Plan of Softening and Filtration Plant



Cross Section of New Clarifiers with Straight-Line Sludge Collectors.

result, an undesirable precipitate is formed which produces a slight turbidity in the finished water. In the new plant addition, by adding the lime for pH correction to zero-hardness zeolite water, which water has had the pH lowered by carbonation ahead of softening to protect the zeolite from incrustation, the difficulty of a precipitate forming will be eliminated. Thus the finished water blend of zeolite-softened and partial lime-softened water will remain clear and yet be of sufficiently high pH to prevent corrosion.

Administration

The Metropolitan Water District is under the direction of Julian Hinds, General Manager and Chief Engineer; R. B. Diemer as Chief Operations and Maintenance Engineer is in charge of the construction and operation of the entire aqueduct system; and H. J. Mills was Resident Engineer in direct charge of construction of the softening plant. The designs were made by District forces under the direction of R. A. Skinner, Office Engineer, with James M. Montgomery of Pasadena acting as consultant. The author is in charge of the operation of the softening plant.

References

1. "Water-Softening and Filtration Plant of the Metropolitan Water District of Southern California" by J. M. Montgomery and W. W. Aultman, *Jour. A.W.W.A.*, Vol. 32, No. 1, Jan. 1940.

2. "The Softening Plant of the Metropolitan Water District of Southern California" by C. P. Hoover, J. M. Montgomery, & W. W. Aultman, *Water Works & Sewerage*, Vol. 87, No. 6, 7 & 8, June, July & Aug., 1940.

3. "Operating Experiences at La Verne Softening Plant" by Lee Streicher, *Jour. A.W.W.A.*, Vol. 37, No. 5, May 1945.

L. F. Warrick To Head Water Pollution Control Research of U.S.P.H.S.

Announcement has been made of the appointment of Louis F. Warrick to the Public Health Service as Senior

Sanitary Engineer in charge of an extensive water pollution control research program. Mr. Warrick will be associated with the nationwide program under Public Law 845. Mr. Warrick's new title will be Chief of the Technical Services Branch of the Water Pollution Control Division, and he will work with Carl Schwob, the director of this division.

A graduate of the University of West Virginia, with a Masters degree from Cornell University, Mr. Warrick has been associated for the past 24 years with the Wisconsin State Dept. of Health, his last position being that of Director of the Bureau of Sanitary Engineering.

A member of many technical societies and organizations, Mr. Warrick has a national reputation in the field of industrial waste and sewage treatment. He is the author of numerous articles, many of which have appeared in *Water & Sewage Works*.

Dr. H. F. Vaughn Sedgwick Medalist in 1949

Winner of the 1949 Sedgwick Memorial Medal of the American Public Health Association was awarded to Dr. Henry F. Vaughn, Dean, School of Public Health, Univ. of Michigan, for distinguished service in public health. The award was formally presented at a banquet on October 27, at the New York meeting, the presentation being made by Dr. Abel Wolman of Johns Hopkins University, former APHA president and chairman of the Sedgwick Memorial Committee.

The citation accompanying the award to Dr. Vaughn paid tribute to his work at the Univ. of Michigan, where since 1941 he has brought the School of Public Health to front rank among institutions of graduate public health study and training. He was chief organizer of the National Sanitation Foundation, and has been active in the cooperation of public health schools and industries.

The Sedgwick Memorial Award, established in 1929, commemorates the services of William Thompson Sedgwick, who for 38 years was professor of Biology and Public Health at Mass. Inst. of Technology.

"Dick" Bardwell Appointed Engineer of Tests by C. & E.I. Ry.

Richard A. ("Dick") Bardwell, who received his B.S., M.S. and Chemical Engineering Degrees from the University of Florida, under Dr.

A. P. Black, and who has held the position of Service Engineer with the National Aluminate Corporation for the past twelve years, in charge of water treatment on the C. & E. I., Monon and T. P. & W. Railroads, has recently been appointed to the position of Engineer of Tests for the Chicago and Eastern Illinois Railroad, with headquarters at Danville, Ill. He will supervise the water treatment for their steam and diesel power and also have charge of the testing of other materials used in railroad service.

"Dick," in this new move, is following in the footsteps of his pioneering "Dad"—R. C. ("Bob") Bardwell, long-time Supt. of Water Supply for the vast Chesapeake & Ohio Ry. system.

WISCONSIN SECTION MEETS IN MILWAUKEE

More than 300 Attend Annual Meeting

MEETING once again in Milwaukee, as it has many times in the past, the Wisconsin Section A.W.W.A. drew a record crowd of at least 301, including 60 ladies.

Chairmen

Incoming
Thos. M. McGuire
Mgr.
Util. Comm.
Plymouth, Wis.

Outgoing
Jas. A. Snow
Mgr.
Water Util.
Ashland, Wis.

The meeting was held October 12 to 14. A breakdown of the registration showed 166 male members and guests registered from 71 municipalities and 75 manufacturers' representatives from 46 companies. Eliminating those registered from Milwaukee, Madison, the State Health Dept., and out-of-state, there were 105 superintendents and operators from 61 Wisconsin municipalities. This is a representative attendance.

New Officers

Officials elected to serve for the ensuing year were as follows:

Chairman
T. M. McGuire, Mgr.
Utilities Commission
Plymouth, Wis.

Vice Chairman
Frank Quimby, Asst. Mgr.
Water Dept.
Racine, Wis.

Secy.-Treas.
Leon A. Smith, Supt.
Water & Sewage Works
Madison, Wis.

Asst. Secretary
Harry Breimeister, Engr. in Chg.
Research Div., Water Dept.
Milwaukee, Wis.

Trustees
James A. Snow, Mgr.
Water Utility
Ashland, Wis.

Edw. F. Tanghe, Asst. Supt.
Water Dept.
Milwaukee, Wis.

Fuller Award

Chosen to receive the George W. Fuller Award was **Harold L. Londo,** Supt. Water Dept., Green Bay, Wis. The citation called attention to "his effective administration of the Green Bay Water Dept. and his effective efforts in promoting the affairs of the Wisconsin Section of A.W.W.A."

Welcome by Mayor

In welcoming the visitors to Milwaukee, Mayor Zeidler called attention to the problems of municipalities in serving expanding areas with water and sewers. While the cities must provide the services, they find it difficult to obtain the money to do so because of restrictions on taxing powers. Cities are tending to fly apart with the use of the automobile. What with city workers moving to suburbs, and other taxing bodies taking more money than can cities, other methods of raising money must be found if the cities are to continue to provide not only water and sewer service but other services demanded by residents as well. Right now there is a strain on water departments to provide proper service on the income received.

Response to the opening remarks was made by **J. A. Snow,** Chairman, who presided at the first technical session.

Specifications for C.I. Mains

The whole first session was given over to a "DISCUSSION OF SPECIFICATIONS FOR THE INSTALLATION OF CAST-IRON WATER MAINS." First speaker was Jos. P. Schwada, City Engineer, Milwaukee, Wisc., who presented the viewpoint of *the Engineer.*

Mr. Schwada said that the engineer's viewpoint was best presented by referring to the major items in the A.W.W.A. standard specifications. In preparing contract documents the engineer should recognize that he has certain responsibilities to assume. These include underground structures which he should make known to the contractor.

Vice Chair.
Frank Quimby
Asst. Mgr.
Water Dept.
Racine, Wis.

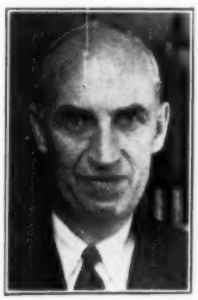
New Trustee
Edw. F. Tanghe
Asst. Supt.
Water Dept.
Milwaukee, Wis.

If the owner is to furnish any materials the engineer should so specify and describe them. The engineer's specifications should include the desired procedure for excavating the trench with full reference to subgrade conditions, and such items as backfilling, the prohibition of blocking, etc.

In laying the pipe, the engineer should call for prevention of foreign material entering the pipe during operations. Jointing materials should be specified in accordance with A.W.W.A. standards which allow tubular rubber rings, asbestos rope, and treated paper rope. (Hemp and jute are excluded.) The engineer should also specify the jointing material desired, whether it be lead, cement, sulfur compound, or mechanical joints.

Other responsibilities of the engineer which require specification or inspection are hydrostatic tests, backfilling, removal and restoration of surfaces, cleaning up, maintenance of surface, and details and dimensions.

Tests on settlement of pipe were described by **Mr. Becker,** Engr., Water Main Extension Div., Milwaukee. With a 54-in. pipe on a 4-in. layer of compacted sand there was observed a uniform settlement of 0.07 ft. A 2-in. layer of sand gave a settle-



Secretaries

Secy.-Treas.
Leon A. Smith
Supt.
Water and Sew.
Works
Madison, Wis.

Asst. Secy.
H. Breimeister
Engr. in Chg.
Res. Div.
Water Dept.
Milwaukee, Wis.

Programmers

Jos. P. Schwada
City Engr.
Milwaukee, Wis.

John R. Baylis
Filt. Engr.
Chicago, Ill.

ment of 0.06 ft., and a 1-in. layer of sand on top of a 2-in. layer of compacted clay allowed a settlement of only 0.05 ft. In all cases the trench bottom was blue clay.

For a 42-in. pipe the settlement was 0.06, 0.05, and 0.04 ft. for 4, 3, and 2 inches of compacted sand, respectively. A 12-in. pipe on 3 inches of compacted sand settled only 0.02 ft.

The viewpoint of *the Contractor* was presented by **E. J. Voelker,** Tomaro Contractors, Carle and Tomasini, Cudahy, Wis. Mr. Voelker said that the engineer should investigate and make known the soil conditions, otherwise the bid will be higher. The same is true for underground structures.

Most contractors prefer to work on jobs where all of the material is furnished by the owner. They also prefer to lay mains without blocking. Among the "beefs" of contractors are change orders not in writing. When there are change orders, not only should they be written, but they should specify whether or not the change is at a unit charge, lump sum, or cost plus.

Discussion

During the question and answer period which followed the two papers, a number of interesting points were brought out.

H. T. Rudgal, Supt., Kenosha, asked how one obtained the desired grade where no blocking was used. Mr. Schwada replied that a good backfill was used and hand tamped or pneumatic tamped and the tamping was measured to ± 0.03 ft.

R. E. Cannard, Gen. Mgr. and Ch. Engr., Manitowoc, recalled that Mr. Voelker speaking as a contractor had said that contractors preferred to work on jobs where the owner furnished the material. Mr. Cannard asked how many water utilities did their own work, how many contracted the work, and of the latter how many furnished the material. A check of the audience showed the following:

Do their own work....	21
Contract main laying	17
Do both	4

Of the 17 municipalities which contract their main laying work *all but one* furnish their own pipe and materials.

H. L. Londo, Supt., Green Bay, asked how much cover should be used before cinders were added. The specifications call for 1 ft.

The question of flushing was raised and discussed by Messrs. Kuranz, Waukesha; Quimby, Racine; Lustig, Zanesville; and Gorder, Monroe. All use flushing or puddling especially where backfilling is done by mechanical means and loose fill results. Some add water first after the cover has been placed on the pipe, others add the backfill and then the water.

On the matter of adding to a contract, Mr. Voelker said he preferred a unit cost plus a flat price for moving, if moving were necessary. In Green Bay, according to Mr. Londo, they work on a cost plus basis and feel that it is quite satisfactory.

Fuller Award
Harold L. Londo
Supt.
Green Bay, Wis.

In response to a question about mechanical joint pipe, a show of hands indicated that 17 municipalities are now using it.

Electron Microscope

"The Electron Microscope and Its Possibilities in Control of Water Treatment" by John R. Baylis, Engineer of Water Purification, Chicago, Ill.

Mr. Baylis described the electron microscope features with particular reference to the one in use at the Chicago South Dist. Water Purification Plant. While the morphology of the bacteria is easier seen, the insides of the bacteria are not so well observed.

It requires two to three hours to run the test, but if the sample requires enrichment through the presumptive test procedure, then it requires 12 to 15 hours. Present use is limited to identification of coliform bacteria, and 85 to 90 per cent correlation is obtained with the completed coliform test. Mr. Baylis doubts that the electron microscope will ever be a routine tool in the laboratory.

Programmers

G. M. Hinkamp
Cons. Engr.
Milwaukee, Wis.

H. E. Jordan
Exec. Secy. A.W.W.A
New York City

Development of Pumping Equipment

"Development of Water Works Pumping Equipment" by Grant M. Hinkamp, Cons. Engr., Lawrence Peterson and Associates, Milwaukee, Wis.

Mr. Hinkamp, who was formerly an engineer with Allis-Chalmers Co., illustrated his paper with slides of the earliest pumping equipment, and reviewed the history of the first steam pumping engines, the safety valve, centrifugal pumps, steam turbines, and electrically-driven pumps.

In the discussion period which followed these two papers, the first questions were directed to Mr. Baylis. **W. U. Gallaher,** Appleton, wanted to know if the bacteria were stained for observation under the electron microscope. The answer was no, just dried. **Jack Fooks,** U.S.P.H.S., Chicago, asked if it were possible to determine M.P.N. with the electron microscope, and the answer was no.

Mr. Gallaher asked Mr. Hinkamp for a comparison of the efficiency of horizontal versus axial flow pumps for low lift. Mr. Hinkamp replied that it depended on the heads.

J. A. Snow, Ashland, asked if vacuum priming was feasible for centrifugal pumps operating on a 10 to 14 ft. head. Mr. Hinkamp replied that there are several devices for vacuum priming, but that the essential thing is to keep the system tight. Leaks occur at stuffing boxes and gaskets. Keeping the pump primed is the best policy.

J. R. Baylis, Chicago, asked, "What is the life of a bearing in water in an axial flow pump?" The reply stated that water lubricated rubber bearings have shown long life. They have been used in pumps for four or more years now and have been used in deep well pumps for many years without deterioration.

Standards for Water Works

"The Value of Standards to the Water Works Industry" was the title of the talk presented at the luncheon by Harry E. Jordan, Secretary of A.W.W.A.

Digressing from the theme of his talk, Mr. Jordan paid tribute to the Public Service Commission of Wisconsin, and the method of operating water utilities under the P.S.C. He emphasized the good of such a system and warned the Wisconsinites not to lose its benefits.

As to standards for the water works industry, Mr. Jordan reviewed the procedure by which standards were developed and adopted by the A.W.W.A. Standardization cuts costs of equipment, and manufacturers are supporting the standardization activities of the Association.

Ground Water in Wisconsin

"Quantitative Determination of Ground Water in Wisconsin" by W. J. Drescher, Hydraulic Engineer, U.S.G.S., Madison, Wis.

The interest in ground water is apparent when one realizes that of 325 public water supplies, 290 of them are from ground water.

Electrical logging is used to locate underground water and studies show there is water under most of the state. In some places the rate of withdrawal is greater than the recharge and water levels are receding where this is the case. Shallow water levels have generally been dropping in spite of recharge, but artesian levels have generally been static except where there has been heavy pumping.

"Getting Water From the Ground" by J. W. Gibb, Civ. Engr., Milwaukee County Regional Planning Dept.

Mr. Gibb pointed out the necessity of having a professional engineer in charge of the project for the owner, because the technical phases of the project require competent technical advice. These phases include geological information, costs, etc.

Wisconsin has a state well drilling code and standards of well construction, and is proposing standards for well drillers. Well construction involves great risk and all precautions possible should be taken. Mr. Gibb concluded his talk with the suggestion that wells should be drilled three inches larger in diameter than the final casing size.

Programmers

H. E. Wirth
Sr. San. Engr.
St. H'lth Dept.
Madison, Wis.

P. A. Reynolds
Rate Anal.
G. K. Hood Co.
Madison, Wis.

H. T. Rudgal
Supt.
Kenosha, Wis.

Presiders

A. P. Kuranz
Supt.
Waukesha, Wis.

Z. A. Gorder
Supt.
Monroe, Wis.

Panel Discussion on Wells

E. F. Bean, State Geologist, Madison, called for cooperation between owners, engineers, and well drillers in their search for water. He also explained resistivity logging of wells, and said that it is now necessary to obtain a permit to drill a well if the amount of water to be withdrawn is 100,000 gpd. or more.

H. E. Wirth, Sr. Asst. San. Engr., State Bd. of Health, Madison, pointed to the need for standardized and complete specifications and explained how the State Board of Health could help the customers.

Joe Egerer, Well Drilling Contractor, Milwaukee, emphasized the need for engineers on well drilling contracts, but said they shouldn't, however, throw all of the responsibility on the contractor for unknown contingency. Straight holes are hard to do but take a shorter time than do crooked ones. Unknown geological formations often cause difficulty with straight holes, and this should not be the responsibility of the contractor. Mr. Egerer also objects to the "catch all clause" in well drilling specifications.

Morris O. Nelson, Vice Pres., J. P. Miller Artesian Well Co., Milwaukee, objected to control and wiring diagrams being the responsibility of the well contractor when actually they should be the responsibility of the pump contractor. Turbine pumps can be used in wells that are straight but not true, and Mr. Nelson believes more of them should be used. He, too, expressed a distaste for the catch-all specification.

In the discussion period which followed, there were many viewpoints brought out on the responsibility of the contractor, the engineer, and the owner. It was also brought out that there are submersible pumps in use in Wisconsin, and that they can be placed as deep as 1200 ft. Troubles formerly observed with bearings in submersible pumps have now been eliminated according to **H. A. Schrader,** of Byron-Jackson Pump Co.

In concluding the session, **O. J. Meugge,** Acting Ch. San. Engineer, State Bd. of Health, Madison, stated that in this program the ground work had been laid for cooperation on the problem of getting water from the ground.

Water Rate Structures

"Water Rate Structures" by Orville Duel, Wisconsin Public Service Commission.

Mr. Duel said the question of water rate structures was concerned with the establishment of a reasonable rate for water of quality, and that the best rate is the one that will attract the most customers with no loss to the producer.

While water rates are somewhat similar to telephone and electric rates, they differ, too, because the service is different. Regarding air conditioning, Mr. Duel believes that if one has the water available he should sell it.

Dr. Duel also discussed the basis of setting water rates including capacity costs, direct charges, output costs, and fixed charges. Reasons for graduated scales, and uniformity or lack of it in blocks, likewise were discussed, as was the two part rate consisting of a demand charge and an output charge.

Fire Protection

"Fire Protection Charges" by Preston A. Reynolds, Rate Analyst, George K. Hood Co., C.P.A., Madison, Wis.

Mr. Reynolds opened his paper with a definition of fire protection service and stated that the value of such service depends on the readiness to serve. Fire protection is not a personal service but is a service to the community. A water system must be large enough to serve the domestic consumers and at the same time provide for fire protection service when

needed. Therefore the size of the system must be larger than for domestic service alone, and that increased size should be paid for by fire protection rates, just as fire hydrants should be chargeable to fire protection and not to domestic consumption.

Mr. Reynolds outlined the steps necessary to setting up a fire protection service rate. These include the determination of the maximum demand, separation of the cost of property by allocating or pro-rating it to each class of service, determination of the rate base, estimating the actual amount of water used for fires (usually 3 to 5 per cent), determination of the normal operating expenses, and finally the apportionment of detailed operating expenses.

Round Table Discussion

Under the chairmanship of **Zenno A. Gorder,** Supt. Water Dept., Monroe, Wis., the final session closed with a round table discussion on the problems of rates. Mr. Gorder called to the platform Mr. Duel and four superintendents who had recently obtained rate increases from the P.S. C. These four were **H. T. Rudgal,** Kenosha, **Tom McGuire,** Plymouth, **A. P. Kuranz,** Waukesha, and **Leon Smith,** Madison.

Old-Timers

*Geo. F. Sullivan** *Milwaukee, Wis.*

W. G. Kirchoffer Cons. Engr. Madison, Wis.

*(*Retired 7 yrs. ago after 28 yrs. with Mueller Co.)*

Mr. Gorder reviewed his own experience in obtaining a rate increase for Monroe, where the utility was practically insolvent when he took over the supervision two years ago.

Mr. Rudgal advised against prorating increases for periods as it involves considerable bookkeeping. When rates were increased there was little complaint from the small users but where high increases were set in minimum rates to large users, the problem of public relations and explanation was more difficult.

Mr. McGuire was in the throes of going through a rate change and wanted to know why the change of breakdown of rate bases was necessary. Mr. Duel said that the new basis included fire protection service as a demand charge and these demand charges have gone up.

Mr. Kuranz complained that a water utility is penalized for good operation. If a superintendent improves his operation and makes a little money, then he has to reduce his rates. He believes that the utility should not be compelled to reduce rates after only one year of operation with a favorable balance.

Mr. Smith of Madison said progress has been made in reference to bonds and interest rates, and that the spread between the theory and the actual value of the bonds had been reduced. He expects further improvement.

When asked how many rate changes had been made in the past few years, Mr. Duel said between 280 and 290. When asked by **Mr. Jark** of Jefferson about charging for fluoridation as a cost of treatment, Mr. Duel said that a recent state law made it permissible to add the cost of fluoridation to the cost of treatment and it can therefore be considered in setting rates in the future.

The meeting closed with a discussion of the tax base.

Water Pollution Control Advisory Board Meeting

The recently organized Water Pollution Control Advisory Board held its second meeting early in October and made several recommendations to Surgeon General Leonard A. Scheele.

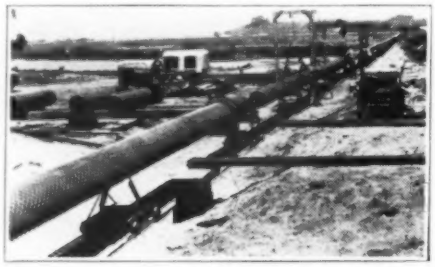
One of these recommendations was that the initial appropriation of $200,000 made to the Government Services Administration by Congress for grants to be used in planning sewage treatment works be concentrated in one or a few river basins instead of being allocated throughout the country.

The Board also called attention to and recommended the preparation of the essentials of the Uniform State Law for states interested in strengthening their waste pollution control activities. It was pointed out that uniform legislation is essential to the success of a nationwide water pollution control program.

Other recommendations included adjustments in the formula for allocation of grants to the states for studies of industrial waste pollution, continuation of special grants for studying research projects, and the establishment of a technical committee to review projects for special funds and pass on allotments to be approved finally by the Public Health Service.

New Ocean Outfall for Watsonville, Calif.

When Watsonville, Calif., was faced with the necessity of installing a new sewer outfall into the bay of Monterey, it took a leaf from its history book and followed the same procedure which it had used 25 years ago for its first outfall line.



The new outfall will extend 1400 ft. out into the bay of Monterey. It is a 16-in. pipeline, fabricated from ½-in. and ⅜-in. wrought iron plates. Fabrication of this line at the site included provisions for overcoming buoyancy and for protection against the abrasive action of shifting sand. This protection was accomplished by wrapping the 1400 ft. of pipe with steel mesh. The outward end was then covered with gunited sand and cement for 800 feet, and the next 600 feet were coated with cement grout by filling an inclosure made of No. 8-gage steel casing.

The accompanying photograph shows the pipeline during fabrication. Its total length is 1500 ft., consisting of 700 ft. of pipe with ½-in. wall and 800 ft. with ⅜-in. wall. This pipeline required approximately 57 tons of wrought iron plates supplied by the A. M. Byers Co. of Pittsburgh.

Watsonville's first line which was similarly treated 25 years ago is reported to be still in good condition.

Reservoirs and Stream Quality

In Volume 64, No. 39, dated September 30, 1949, of the Public Health Reports there appears an article by Woodward and LeBosquet on the "Effects of Reservoir Operation on Stream Water Quality."

Copies of this issue of Public Health Reports may be obtained for ten cents each from the Supt. of Documents, U. S. Govt. Printing Office, Washington 25.

STATUS OF WATER FLUORIDATION IN 1949*

by

HARRY A. FABER**

Research Chemist

THE CHLORINE INSTITUTE, INC.
NEW YORK, N.Y.

THE practice of fluoridation is unique among methods for the treatment of public water supplies. It is unique because it is an additive rather than a subtractive method. All other methods of water treatment, applied for the protection of public health, have been devised to reduce excessive concentrations of constituents present in natural waters. Fluoridation is employed to increase inadequate concentrations of a constituent present in natural waters. There is little difference in principle between fluoridation and other methods of treatment, but there is a considerable difference in philosophy.

In its general attitude toward this unique method of water treatment, the water works industry will do well to recognize, as did Wolman in his foreword to "The Quest for Pure Water," that: "Neither the consumer nor the professional should be disconcerted by this endless adventure in search for 'pure' water. It is the natural concomitant of advancing knowledge and expanding horizon." The specific attitude of the water works industry, however, will be determined by factual information regarding the present status of water fluoridation. It is the purpose of this paper to present such information in summary form.

The Background

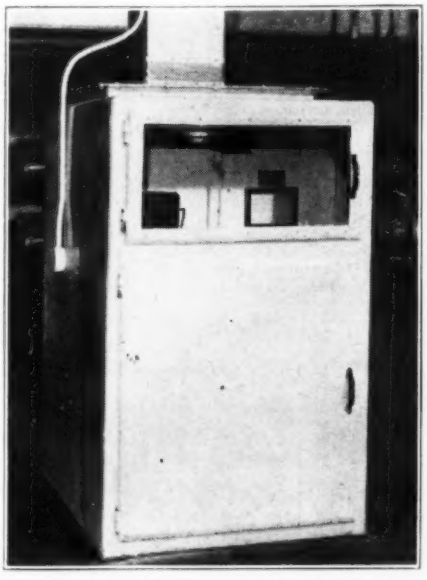
The basic evidence demonstrated by carefully conducted epidemiological studies is this: In communal water supplies minimum concentrations of naturally occurring fluoride ion are desirable and excessive concentrations are detrimental. The range between the limiting concentrations is very narrow.

The existence of the fluoride ion in drinking water was discovered less than twenty years ago, and it was soon recognized that excessive concentrations of this ion were the cause of fluorosis or mottled tooth enamel. Subsequent investigations have established 1.5 ppm. fluoride as the maximum concentration which does not produce fluorosis. With higher concentrations mottled tooth enamel becomes increasingly more severe; at 6.0 ppm. almost every child will be affected.

The Author

Much study has been given to the development of methods for the treatment of water to remove the fluoride ion. Fluoride removal methods so far developed are extremely costly to install and operate. More than 350 public water supplies in the United States are reported to contain excessive concentrations of fluoride ion, and fluoride removal treatment is provided in only 10 of these.

In 1938 studies by Dean disclosed the existence of an inverse ratio between dental caries (tooth decay) in children and the fluoride content of the communal water supply. His results showed dental caries experience to be at a minimum when the water contained 1-1.5 ppm. fluoride. This concentration of fluoride ion was found, by examination of over 7,000 school children, to be associated with a 50 to 65 per cent reduction in caries prevalence. The relation is illustrated in Fig. 1.



First Dry Feeding Installation for Sodium Fluoride in U.S.A.
(Omega Gravimetric Feeder)

Evidence of the relation between dental caries and the fluoride content of water supplies has been largely based upon studies of children. There have been few data concerning the dental health of adults who were exposed to fluoride-containing water during childhood. The results of a study by McKay provides some evidence that the inhibitory effect of fluoride, once acquired, may be permanent. His study was based on the examination of 400 adults who were natives of Colorado Springs, Colo., where the water supply has a natural fluoride content of 2.6 ppm. and has been in use for about 70 years. While these adults were found to have mild dental fluorosis, they exhibited an unusually low rate of permanent tooth loss. A comparison of the findings with the normal expectancy of tooth loss for the United States is illustrated in Fig. 2.

The Theory

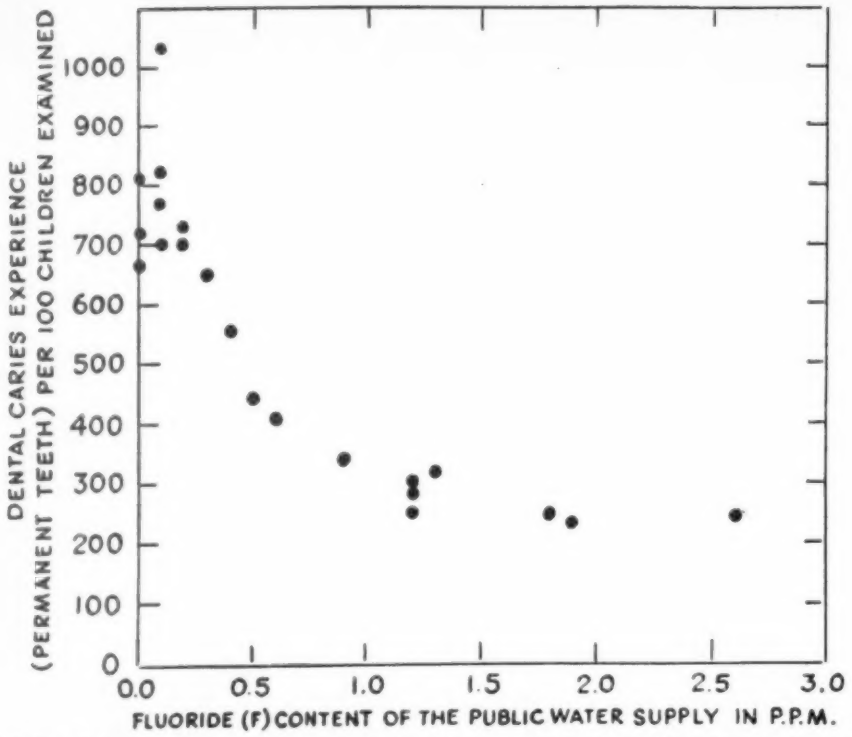
An inverse relationship appears to exist between the fluoride content of natural waters and the prevalence of dental caries. Recognition of this relationship led to the proposal that fluoride be added, as a caries control measure, to waters deficient in that constituent.

The control of caries by adding fluoride to a public water supply is based on the hypothesis that the water so treated will have the same effect as one naturally containing fluoride. This hypothesis appears justified by chemical and biological considerations, by laboratory research, and by epidemiological evidence.

At least eight years will be required before a preliminary indication of the full effect of fluoridated water

*A paper presented at the Pennsylvania Section A.W.W.A., Harrisburg, Pa., and containing supplementary material prepared at the request of *Water and Sewage Works* and here published by permission of the Assoc.

**Editorial Associate, *Water & Sewage Works*.



Relation Between Amount of Dental Caries (Permanent Teeth) and Fluoride Content of Public Water Supply.—(From H. T. Dean)

(Observations on 7,257 selected 12-14 year old white children of 21 cities in 4 states.)

on dental caries can be determined; that is, until children have used fluoridated water throughout the period of tooth enamel formation (through age eight for all teeth except the third permanent molars).

The validity of the hypothesis can be tested only by carefully controlled experimental studies. Several studies of this nature are now under way, generally planned on an 8-10 year basis, and directed by specialized technical personnel. The application of fluoride is made under the supervision of the State Department of Health. Dental and medical studies are made of children in the community, and another community having a similar water supply low in fluoride content is studied as a control.

In the United States, the first experimental studies of water fluoridation were inaugurated in 1945; in January at Grand Rapids, Mich., and in May at Newburgh, N.Y. Both cities employ sodium fluoride as the source of the fluoride ion.

Official Attitudes

Up to the present year, the attitude of the water works industry toward fluoridation treatment was generally in accordance with the summary presented by Wolman in 1943, and by his four guiding principles suggested in 1947. Briefly, this attitude approved the carefully controlled experimental studies, but recommended the avoidance of more general adoption of fluoridation until the completion of the controlled experimental studies.

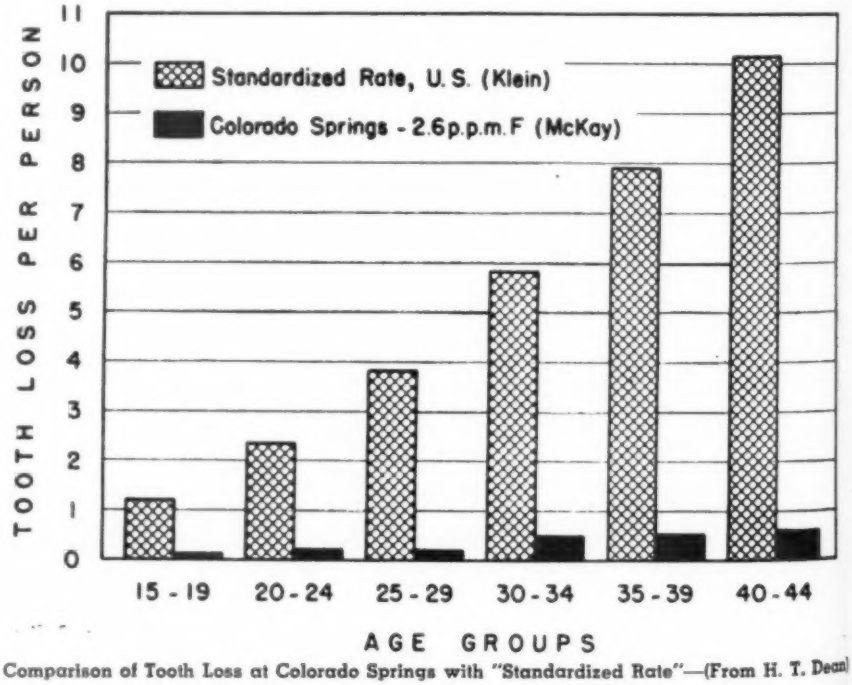
The American Water Works Assn. in 1949, gave official acceptance to the practice of water fluoridation for the purpose of reducing tooth decay. A statement of recommended policy and procedure, approved by the Board of Directors of the Association, was presented on June 1st at the Annual Conference in Chicago by A. P. Black, Chairman, Special Committee on A.W.W.A. Policy re: Fluoridation of Public Water Supplies. The approved policy was clearly stated[3].

"In communities where a strong public demand has developed and the procedure has the full approval of the local medical and dental societies, the local and state health authorities, and others responsible for the communal health, the water departments or companies may properly participate in a program of fluoridation of the public water supplies."

Adoption of this policy was based on substantial evidence that the addition of 1.0 to 1.5 ppm. of fluoride to water supplies may accomplish a reduction of 50 to 65 per cent in caries prevalence. While several communities are now testing the efficiency of this measure, its effect cannot be determined for eight years. Meanwhile, an ever-increasing number of communities are willing to provide the cost of fluoridation for the purpose of giving anticipated protection to the oncoming generation of children at the earliest possible time.

The official sanction by the A.W.W.A. of the practice of water fluoridation may be expected to have considerable influence on the future development of this practice. Accordingly, the appraisal of certain items in the statement of recommended policy and procedure is warranted.

1. The water works profession has been given a clearly defined position in the practice of water fluoridation. Water utilities can properly undertake fluoridation when the public demands that health authority approval precede adoption of the treatment.



Comparison of Tooth Loss at Colorado Springs with "Standardized Rate"—(From H. T. Dean)

The cost of fluoridation may properly be charged against community health expenditures.

2. In the adoption and operation of fluoridation, uniform procedures have now been recommended. These include specific information regarding handling fluoridation requests, responsibility for fluoridation, liability involved, steps in authorization, disposition of cost, items of cost, application and control of treatment.

3. Additional experimental studies of fluoridation are recommended, especially to determine the effect of climatological conditions on this practice.

4. Finally, and perhaps most important, empirical installations of fluoridation can now be approved.

Definition of Terms

The committee statement explains, but does not define, the terms *experimental* and *empirical*. In the practice of this treatment, the following definitions would appear to be suitable:

Experimental Installations: Those in which fluoride is applied to water under controlled conditions, with the concurrent use of scientific methods to test the fluoride-caries relationship.

Empirical Installations: Those in which fluoride is applied to water under controlled conditions, without the concurrent use of scientific methods to test the fluoride-caries relationship.

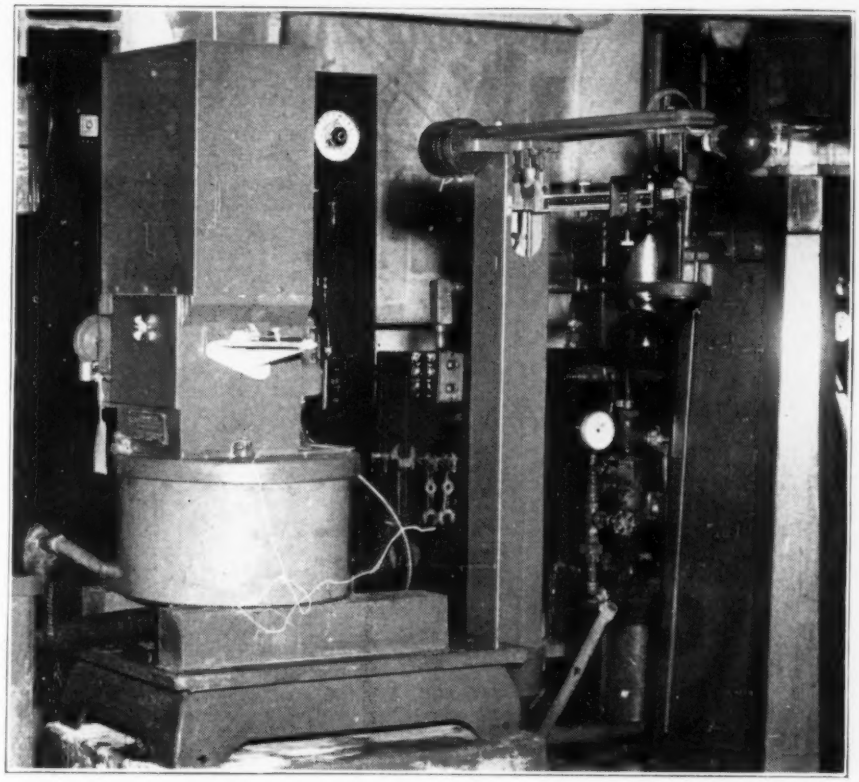
Results of Fluoridation Survey

Ultimate jurisdiction over the treatment of a public water supply is vested in the state health authority. It is clear that a program of water fluoridation can properly be undertaken only with the approval of that authority. Accordingly, the general attitude of the state in respect to water fluoridation will have an important influence on the future development of this practice.

A survey has been made by the author to determine the water fluoridation policy of the various state health authorities. A questionnaire was sent to the Chief Sanitary Engineer of each state, and replies were received from all 48 states. The cooperation of these individuals has made it possible to present a comprehensive summary of the status of water fluoridation as of August, 1949.

State Policy: Approximately 40 per cent of the states have adopted a definite policy regarding the fluoridation of public water supplies, and 70 per cent of the states consider the A.W.W.A. Statement of Policy acceptable. All of the states which may give approval to experimental installations, however, are not willing to approve empirical installations. Replies from the 48 states show:

19 have adopted a policy regarding fluoridation.
33 consider the A.W.W.A. Statement of Policy acceptable.
34 may give approval to Experimental installations.
27 may give approval to Empirical installations.



Baraboo, Wis.—W & T Volumetric Feeder for Applying Sodium Fluoride

State Procedure: Only one-third of the states have adopted a definite procedure regarding the fluoridation of public water supplies, but 70 per cent of the states consider the A.W.W.A. Statement of Procedure acceptable. A maximum fluoride ion concentration of 1.5 ppm. would be permitted by twenty-two states. Replies from the 48 states show:

16 have adopted a procedure regarding fluoridation.
33 consider the A.W.W.A. Statement of Procedure acceptable.
7 would permit a maximum of 1.0 ppm. F.
1 " " " " " 1.1 " F.
3 " " " " " 1.2 " F.
22 " " " " " 1.5 " F.

Present Fluoridation Installations: A total of 17 fluoridation installations are in operation in the public water supplies of 9 states; each of seven states has one installation, one state has two installations, and one state has eight installations. Eleven of the installations are classified as experimental and six as empirical. The location of these installations is shown in Table I.

Table I
PUBLIC WATER SUPPLY DATA
FLUORIDATION INSTALLATIONS

State	Experimental	Empirical	Total
Idaho	1		1
Illinois	1		1
Kansas	1		1
Michigan	1	1	2
New Jersey	1		1
New York	1		1
North Carolina	1		1
Texas	1		1
Wisconsin	3	5	8
	11	6	17

A total of 3 fluoridation installations are in operation in institutional water supplies of 2 states; all of these are experimental installations. The location of these installations is shown in Table II.

Table II
INSTITUTIONAL WATER SUPPLY DATA
FLUORIDATION INSTALLATIONS

State	Experimental	Empirical	Total
Connecticut	1		1
Massachusetts	2		2
	3		3

Future Fluoridation Installations: The growth of public water supply fluoridation is indicated by installations which have already been approved by state health authorities or which are now under consideration by them. A total of 14 fluoridation installations are reported to be already approved, and a total of 20 installations are under consideration. The lo-

Evanston, Ill.—Loss-in-weight Type Gravimetric Feeder with Chart Recorder
(Supt. Horace Frye and Omega machine with a rate capacity of 0.5 to 50 lb. per hr.)

cation of these installations is shown in Table III below.

Effect of Fluoridation

Grand Rapids, Mich: It is considered that positive evidence of the effect of fluoridation in reducing dental caries has not been produced in the four and one-half years of experience at Grand Rapids. The Chief of the Public Health Dentistry Section, State Department of Health, states[2]: "I do not see how we can obtain any tangible evidence from Grand Rapids for another three or four years. The children must use the treated water during the period of permanent tooth formation, which is from birth through eight years of age, and these teeth must then be erupted into the mouth where they can be examined. Only then can any definite conclusions be drawn."

Table III

PUBLIC WATER SUPPLY DATA
FUTURE FLUORIDATION INSTALLATIONS

State	Already Approved	Under Consideration
Arkansas	1	
Colorado	2	
Connecticut		3
Delaware		1
Florida	1	1
Kansas		1
Michigan	3	
New Jersey	1	
New York	1	3
North Dakota		2
South Carolina		1
South Dakota		1
Texas	1	1
Virginia		1
Wisconsin	4	4
Wyoming		1
TOTAL	14	20

Newburgh, N.Y: Dental findings in the Newburgh-Kingston project have recently been reported[3] by the Chief of the Dental Health Section, State Dept. of Health. The data relate to comparative trends in DMF (decayed, missing, filled) teeth of children in the group 6 to 12 years of age. Examinations included 3400 children in Newburgh, all assumed to have been continuously exposed to fluoridated water for a period of three years, and 2800 children in Kingston where the water is not fluoridated.

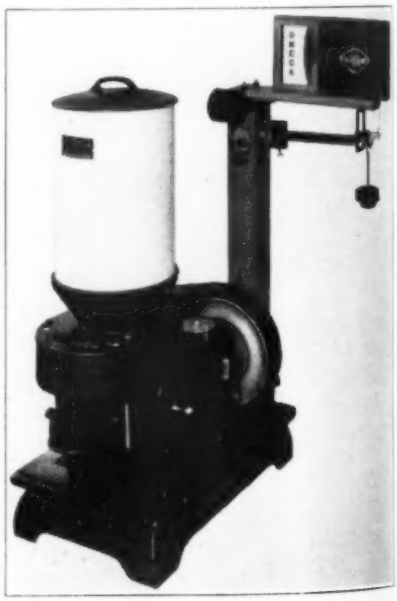
The DMF experience rate in Newburgh averages 30 per cent lower than in Kingston among children of this age group. Rates of DMF experience were found to be similar in the two cities during the first post-fluoridation year, but to be consistently lower thereafter in Newburgh than in Kingston. The major benefit of fluoridation is shown by those teeth generally less subject to caries attack; the permanent molars show an 18 per cent lower DMF experience rate, and the incisor teeth a 55 per cent lower rate in Newburgh than in Kingston. Another five years will be required to present a final report.

Pediatric findings in the same project were reported[4] to show no deleterious effect of fluoride intake. The same pediatric team has continuously studied 500 children in Newburgh and the same number in Kingston. By means of physical examinations, laboratory tests, bone X-ray studies, and special examinations no detectable differences can be found between the children in these two cities.

Sheboygan, Wis: The Director of the Division of Dental Education, State Board of Health, has reported[5] on the third post-fluoridation survey at Sheboygan, where fluoridation was started in February, 1946. His survey shows that, in less than three years, the DMF rate for kindergarten children (5 to 6 years) has been reduced 28 per cent. The DMF rate for fourth grade children (9 to 10 years) has been reduced 19 per cent. In the opinion of the Wisconsin State Board of Health, the evidence presented demonstrates that artificial fluoridation of a public water supply has reduced caries about 20 per cent.

Leadership in Wisconsin

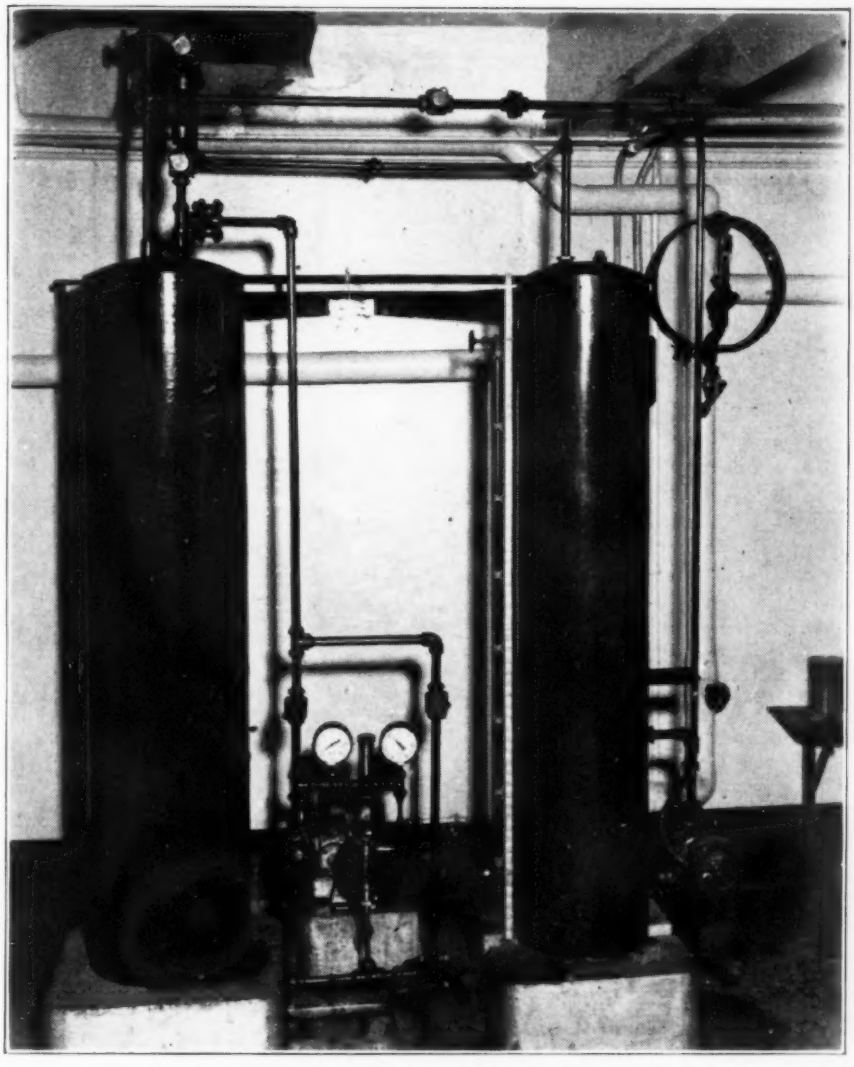
Special comment should be made concerning the growth of water fluoridation in the State of Wisconsin.



Midland, Mich.—Volumetric Type Grooved Disc Feeder
(Omega Feeder, 0-400 oz. per hr; dissolving chamber not shown)

where 3 municipal supplies are now treated on an experimental basis, and 5 on an empirical basis. As of August, 1949, approval had been given by the State Dept. of Health to 4 more installations, and four others have been submitted to the Department for consideration. The State Supervisor of Dental Education reported[6] that, in addition to the above, ordinances for the fluoridation of water have been approved by 33 municipalities and have been introduced, but not yet voted upon, by 16 municipalities.

As early as 1945 the Wisconsin State Dental Society adopted a recommendation approving fluoridation of water supplies deficient in fluorides, providing that the application be under the supervision of dental, medical, engineering and public health personnel. After considerable study this action was approved by the State Board of Health in 1946. The policy of the Board was modified in 1949 so as to accept empirical installations of fluoridation. The State Dental Society has a very active committee on the fluoridation of water which gives much time and effort to educational discussions before civic groups. This committee has been largely responsible for local demands that the pubic water supply be fluoridated. The favorable attitude of state health officials has, of course, been essential.



Madison, Wis.—Equipment for Feeding Hydrofluoric Acid

Fluoridation Chemicals

The fluoridation of nearly all water supplies is accomplished by the carefully regulated application of sodium fluoride. The commercial salt, having a sodium fluoride content of 90 per cent, is generally employed. The composition of this salt is such that 20.4 lb. per mil. gal. are required to apply 1.0 ppm. fluoride ion. Since many natural waters contain some fluoride ion, the amount applied must represent the difference between the concentration originally present and the concentration desired in the finished water.

One water supply employs 60 per cent hydrofluoric acid as the source of fluoride ion. The liquid is applied from storage tanks at several unit wells by means of special chemical feed pumps.

Consideration has recently been given to the use of sodium silico-fluoride instead of sodium fluoride to supply the fluoride ion. The silico-fluoride (Na_2SiF_6) contains 60 per cent fluoride ion, while the fluoride (NaF) contains 45 per cent. The prices of these compounds are such that sodium silico-fluoride will supply fluoride ion at about one-fourth the cost of obtaining it from sodium fluoride. Sodium silico-fluoride is a by-product from the manufacture of phosphates from certain phosphate rocks. Its solubility is low (4.7 grams per liter at 2°C) and may be a disadvantage in this application, but should present no difficulty where the material is applied through dry feed equipment which is provided with adequate dissolving facilities. The low solubility may create a storage and feeding problem where solution feeders are employed. Studies of the suitability of this compound should include determination of its toxicity by means of animal feeding experiments.

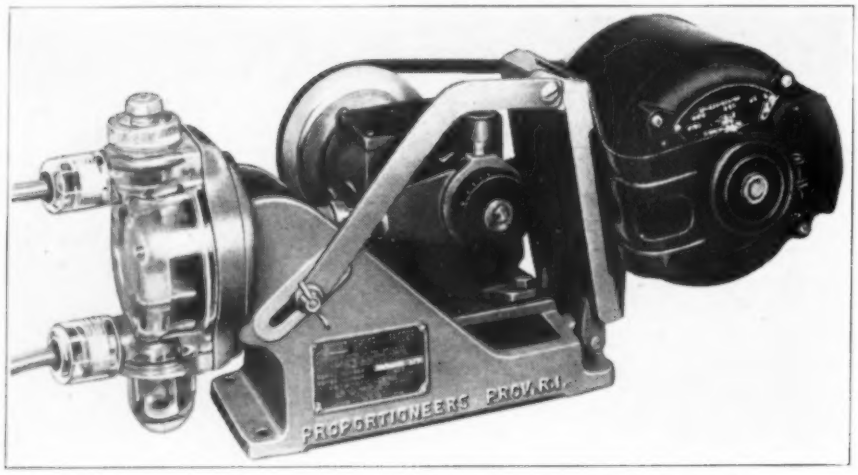
Milwaukee was first reported to be considering the use of sodium silico-fluoride as a substitute for sodium fluoride. It was estimated that water fluoridation would cost about 2.75 cents per capita per year with the silico-fluoride as against 14 cents with the fluoride salt. The first plant scale study of sodium silico-fluoride appears to be that at the Sheboygan, Wisc., plant in October of this year when the feeding of 1000 pounds was reported to be started on an experimental basis[7].

Rhinelander, Wisc., is proposing[8] the use of hydrofluosilicic acid, to be applied by means of chemical feed pumps.

Fluoridation Equipment

Sodium fluoride, or any fluoride salt, must be applied by means of accurate feeding equipment. Either gravimetric or volumetric dry-feed equipment, or positive displacement liquid-feed equipment, having an accuracy of 5 per cent is required. The most suitable type of equipment will probably be determined by the weight of chemical to be applied per hour or per day.

Special precautions must be taken to protect the operators from inhaling fluoride dust when charging the hoppers of dry-feed equipment. It is recommended that the hoppers be equipped with dust collectors which include bag filters, operate under positive air pressure, and are vented to the atmosphere outside the plant.



Proportioneers' Smallest Unit for Applying Sodium Fluoride Solution

Each operator who handles fluoride should be provided with his individual toxic-dust respirator and use it only when handling that chemical. When liquid-feed equipment is used, at least two solution tanks must be available for the preparation and storage of the fluoride solution.

Equipment suitable for feeding sodium fluoride may be obtained from the following manufacturers and perhaps others:

Gravimetric loss-in-weight and volumetric types of feeders with dust collecting equipment—Omega Machine Co., Providence, R.I.; Wallace & Tiernan Co., Inc., Newark, N.J.

Volumetric types of feeders with dust collecting equipment—Infilco, Inc., Chicago, Ill.

Positive displacement types of liquid feeders (diaphragm types)—Proportioneers, Inc., Providence, R.I.; Wallace & Tiernan Co., Inc., Newark, N.J.

Positive displacement types of liquid feeders (plunger types)—Proportioneers, Inc., Providence, R.I.

Other types of liquid feeders: Decanting type—Liquid Conditioning Corp., Philadelphia, Pa.; Constant-head orifice type—Infilco, Inc., Chicago, Ill.; Wet chemical type—The Permutit Co., New York, N.Y.

Equipment suitable for feeding 60 per cent hydrofluoric acid may be obtained from the following manufacturer and perhaps others: Fluid plunger types of chemical feed pumps—Proportioneers, Inc., Providence, R.I.

Financing Fluoridation

It is obvious that the fluoridation of a water supply will increase the utility's operating expense and investment cost. The total cost is estimated[92] to range from 5 to 15 cents per capita per year, depending upon the amount of fluoride in the supply before fluoridation, the size of the community and the per capita use of water. The cost of fluoridation may be considered a proper charge against communal health activities since the benefits to be derived by consumer bear no relation to the amount of water used. This method of financing is probably that most widely employed to date.

However, the laws of the state of Wisconsin relating to water charges were amended during 1949 to read[109]:

"The council or board of any town, village or city operating a public utility may, by ordinance, fix the initial rates and provide for this collection monthly, quarterly or semiannually in advance or otherwise. The rates shall be uniform for like service in all parts of the municipality *and shall include the cost of fluorinating the water*. The charges shall be collected by the treasurer."

"In the case of a public water utility, the commission shall include, in the determination of water rates, the cost of fluorinating the water in the area served by such public water utility, provided the local governing legislative body in which such public water utility is situated authorizes the fluorination of water in the area primarily served by such public water utility."

Needed Research

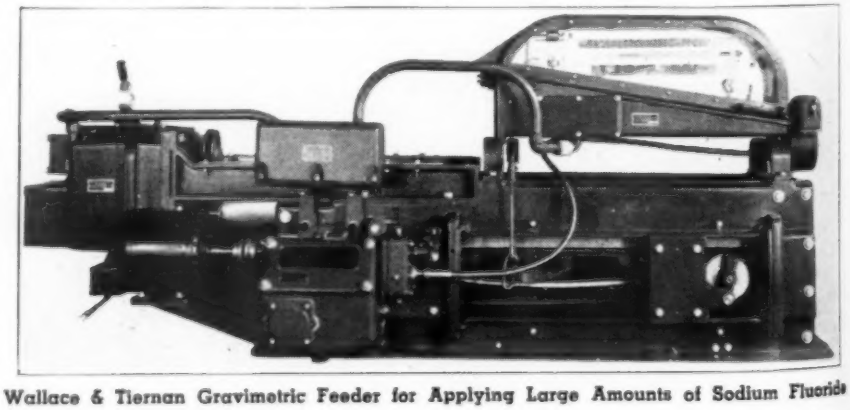
Further experimental studies are necessary to determine the effect of climate and geographical location as factors in water fluoridation. The A.W.W.A. statement of policy discusses evidence that a constant and uniform fluoride content of 1.0 ppm. may be inadequate, where water consumption is low, and fail to exert the maximum protective effect; or may be excessive, where water consumption is high and result in the formation of mottled enamel. A recent report[96] indicates that in one community in New Mexico fluorosis may result from the presence of as little as 0.7 ppm. in the water supply. It has been suggested[111] that the technic of fluoridation be refined on a seasonal basis for each installation; by this method the fluoride concentration would be varied in relation to the temperature of the locality (and hence the water intake) so as to receive the maximum protection from caries and the minimum development of mottled enamel.

It is reported that free available residual chlorine interferes with the test for fluoride as given in the latest edition of "STANDARD METHODS FOR THE EXAMINATION OF WATER AND SEWAGE," and a satisfactory method for the elimination of errors due to such interferences must be developed.

The fluoridation of one water supply appeared to result[112] in a serious increase of cracking in ice manufactured from the water. This problem is reported to occur in no other municipality practicing fluoridation and may be due to the exceptionally low dissolved solids content (45 ppm.) of the particular water supply.

Summary

In the United States, experimental and empirical installations for the fluoridation of public water supplies are growing in number. The A.W.W.A. has given official acceptance to the practice of fluoridation, under properly controlled conditions, and has provided a statement of recom-



Wallace & Tiernan Gravimetric Feeder for Applying Large Amounts of Sodium Fluoride

mended policy and procedure. Factual information is presented in this paper with reference to the present status of this practice, to the end that the water works industry may be aided in determining its specific attitude toward water fluoridation.

Acknowledgment

The author gratefully acknowledges the assistance of the state sanitary engineers who provided data for the purpose of this paper, and of many other individuals not indicated.

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Chart Showing Relation Between Barrels and Any Other Circular Containers

By W. F. Schaphorst, M. E.
Newark, N. J.

Questions as to the relation between barrels and other circular containers are common, but the answers are not always readily given because of the many different barrel standards in use. For the accompanying chart 50 gallons per barrel is used as the standard. In the event that your barrel is different, the chart is still applicable by making a simple correction as explained below.

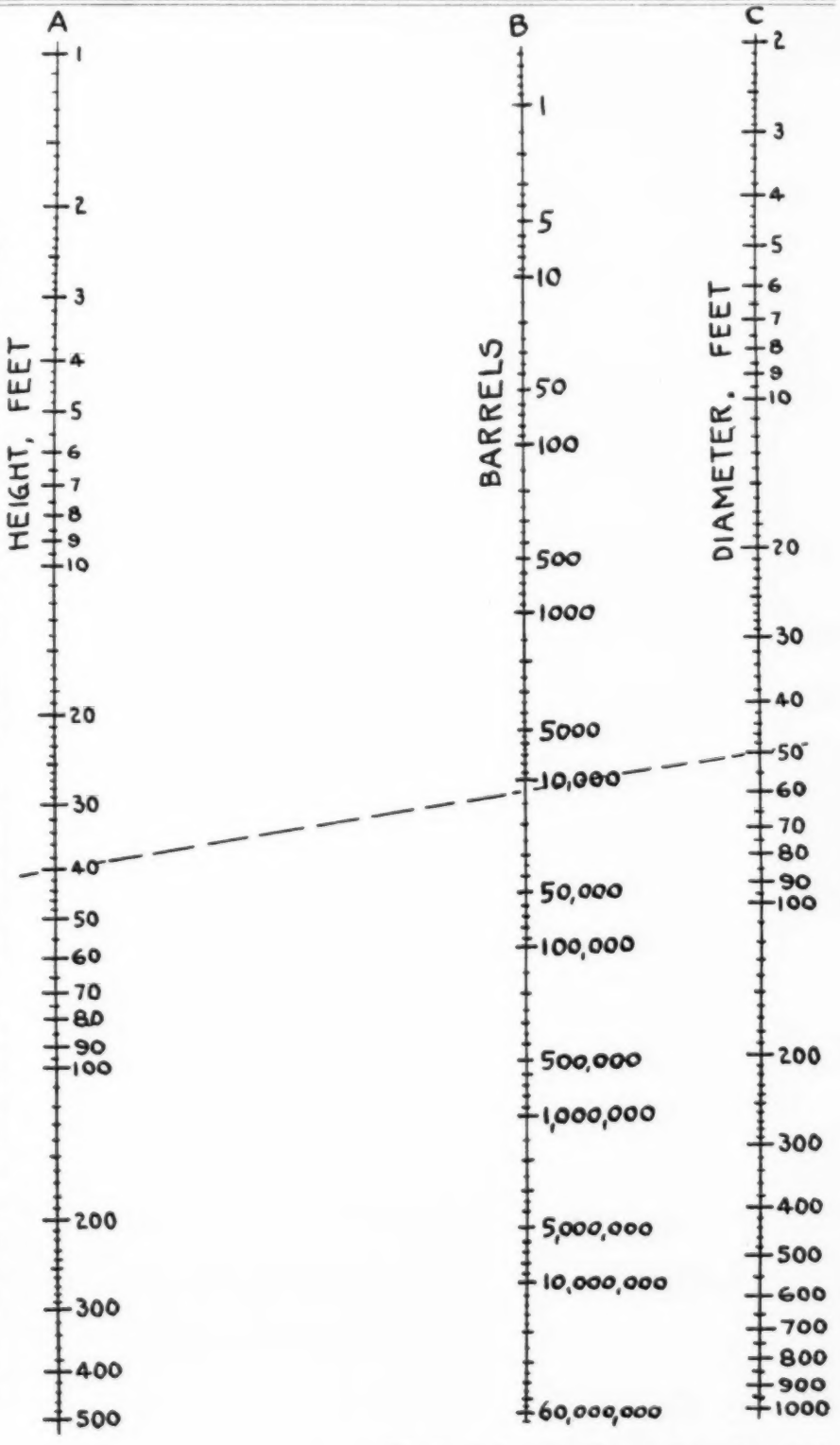
To use the chart, simply run a straight line across it connecting the height of the tank with its diameter and the volume in barrels is immediately found in the central column, column B.

For example, take a huge vertical cylindrical tank 50 ft. in internal diameter and 40 ft. high. How many barrels will the tank hold?

Run a straight line through the 40 in column A and the 50 in column C as indicated by the dotted line. The intersection of that line with column B then shows us that the tank will hold about 12,000 barrels. Read the columns in the same way that you read an ordinary thermometer.

Suppose that in your work you use a different barrel standard. The chart can be applied to your barrel by following this rule: Divide 50 by your barrel standard and multiply the quotient by the result found in column B. The product, then, is the correct number of barrels.

Thus for example, assume a barrel contains only 32 gallons, which is one standard that is commonly used. How many such barrels will the above tank hold? Dividing 50 by 32 equals 1.56. Multiplying 12,000 by 1.56 equals 18,720 barrels as the correct answer, for a 32 gal. standard barrel.



MAINTAINING TRANSMISSION LINE CAPACITY WITH CHLORINE-AMMONIA

15 Years' Use Proves Value In Maintaining High Flow Rates at Moderate Cost

by
LAURENCE J. GRISWOLD
Engineer
WATER SUPPLY BOARD
UTICA, N.Y.

IN December, 1933, chlorine-ammonia equipment was installed at the reservoir end of a 24-inch cast iron transmission main, furnishing the City of Utica with its principal source of water supply.

The primary purpose of this installation was to prevent or retard, if possible, the loss of carrying capacity, which occurred in a comparatively short time, after each mechanical cleaning of the twelve-mile line.

The first report on what was then considered a worthwhile experiment was given before the American Water Works Association in 1934 by Hodges and Ackerman[1], after about nine months of use and observation. In April, 1936, and again in 1937 the original data, brought up to date, was reported in *Water Works and Sewerage* (now *Water & Sewage Works*), in each case with continued encouraging results, but still after too short a period for any final conclusions.

Use Proves Value

Now after fifteen years of continuous use of chloramines on this pipe line, with frequent checks as to pipe line condition, some definite conclusions can be drawn. (a) This treatment process does maintain carrying capacity with but slight loss over long periods of time when used on waters of a certain type[1]. (b) While the original reports on the use of chloramines at Utica stressed the prevention of tuberculation, it now appears from a study of all of the Utica data and the reports of others[2][3] that the elimination of bacterial slime growth on the interior of the pipe is probably of equal importance with the prevention of tuberculation in maintaining high pipe line carrying capacity. (c) An application ratio of ammonia to chlorine of 1:5-6, with a residual of 1 to 1.5 ppm. at the end of the twelve-mile 24-inch unlined cast iron pipe line, has been effective in maintaining the carrying capacity of the line with an average loss in the Hazen-Williams "C" value of only ten points in seven years.

The bacterial aspects of the formation of tubercles and slime in water mains have been reported in the technical press and journals. Excellent papers by Reddick and Linderman[4], Committee Report[5], Wilson[6], and Storkey[7], quite adequately cover this phase of the subject.

The writer believes that the economics of the application of the chlorine-ammonia or the superchlorination treatment in its relation to increased water supply is of sufficient general interest and importance to merit a somewhat detailed study and report on the results achieved at Utica.

Data on Operation

The statistical and chronological data covering the transmission line are shown in Table A for ready comparison and reference. A paper, presented before the New England Water Works Association in 1924[8] by Frederic E. Beck, (then Chief Engineer of the Utica Water System) on the "Increase of Available Water Supply with No Capital Investment" reported the success of a waste water survey and the first mechanical cleaning of the 24-inch line. (Table A, line 2.) These operations were well worth reporting, since the increased supply made available thereby, had at least for the time being postponed an estimated $713,000 pipe line construction program, which was then considered necessary to keep supply ahead of demand.

To maintain a "C" value of not less than 100 after the first cleaning of the line in 1922, without the use of the chlorine-ammonia treatment, the line was cleaned on the average every 19.7 months. This frequent cleaning maintained an average daily flow for the period from October, 1922, to March, 1934, inclusive, of 11.3 mgd. or 2.5 mgd. more than the line was carrying in 1922 when it was first cleaned. It is to be noted here that the loss in carrying capacity during this period, when only cleaning was used to maintain high flow, did not take place at a uniform rate.

By plotting the Hazen-Williams "C" values obtained by pipe line measurements taken over a period of seven cleanings, it was possible to obtain an average curve showing the rate of loss of carrying capacity. From this curve could be computed the average flow for any period between cleanings, and the data so computed is the basis for Curve I, showing the average increase in water produced, plotted against frequency of cleaning. (See accompanying graph.)

The sharp loss in carrying capacity which takes place in the first few months after cleaning without the chloramine treatment can be accounted for only by the immediate and comparatively rapid regrowth of slime on the pipe interior, with the formation of tubercles the factor causing the slower loss of capacity over a longer period of time.

In the graph, data are plotted for the increased water produced and cost per million gallons of this water against frequency of cleaning.

Curves I and III are the quantity and cost curves respectively for the 24-inch line without the use of the chlorine-ammonia treatment. Curves II and IV are the quantity and cost curves respectively for the line with the chlorine-ammonia treatment. In the case of each pair of curves the data has been extended somewhat beyond the limit of actual experience by a reasonable extension of the plotted curves based on loss of "C" value.

With the two sets of curves plotted as shown, some interesting comparisons may be made as to costs and water produced. Unfortunately, data are not available for the same total periods of time for both sets of curves.

Cost Data

On Curve IV showing the cost per million gallons when using chloramines and cleaning, it will be noted that a minimum cost per mil. gal. of water produced is reached with a frequency of cleaning of every 5½ years. At that frequency of cleaning of the line, the average increased flow was slightly over 5.1 mgd. (Curve II)

at a cost of $2.40 per mil. gal. (Curve IV.) At the same cost per mil. gal. without the use of chloramines (Curve III) it would have been necessary to clean the line about every seven months and the average increased flow would have been about 3.65 mgd. (Curve I).

A comparison of Curves I and II indicates a slightly greater effectiveness of cleaning when using chloramines. At the zero line it will be noted that the increased flow after cleaning was 5.5 mgd. when using chloramine, but only 5.3 mgd. without water treatment.

Since the loss in carrying capacity, when using chloramines as reflected in Curve II is very gradual, no very useful or extended comparisons may be made with Curve I showing the same data without chloramines. It is interesting to note, however, that with a frequency of cleaning of every nine years (Curve II), when using chloramine, the average increased flow over the period was about 4.8 mgd. at a cost of $2.45 per mil. gal.

For the same 4.8 mil. gal. average increase without chloramine it would have been necessary to clean the line about every one and one third months (obviously an impractical procedure) at a cost of about $9.80 per mil. gal. of increased supply.

Since the minimum rate for water in the Utica schedule is $68.19 per mil. gal., it would be profitable from an economic standpoint to clean the line monthly either with or without the use of chloramines, since the cost per mil. gal. to produce at this frequency of cleaning would be respectively $12.80 and $11.90.

Practical Considerations

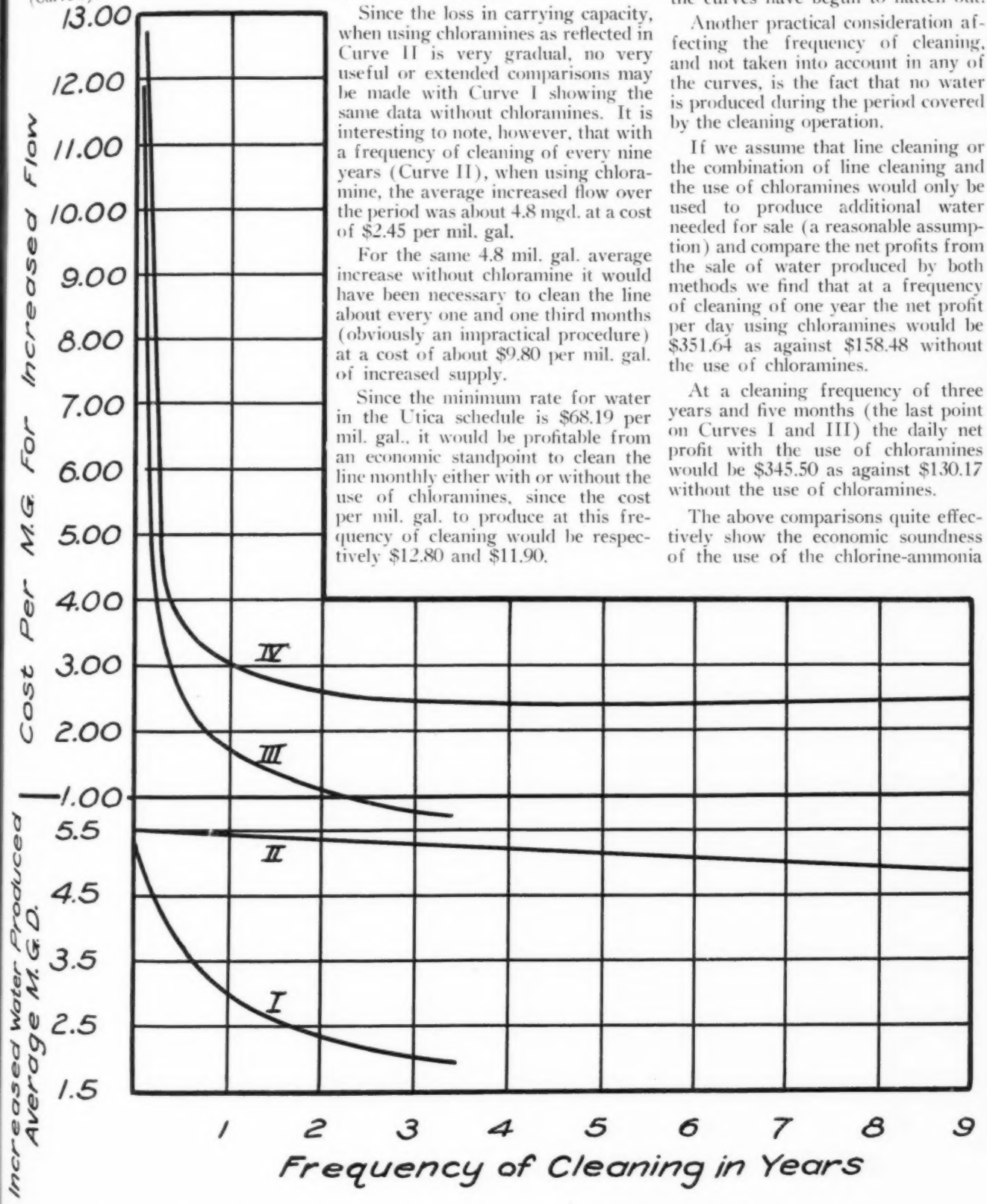
From an operating standpoint it would not be practical to clean the line much more frequently than once each year. This practical consideration fortunately coincides with points on Cost Curves III and IV, where the curves have begun to flatten out.

Another practical consideration affecting the frequency of cleaning, and not taken into account in any of the curves, is the fact that no water is produced during the period covered by the cleaning operation.

If we assume that line cleaning or the combination of line cleaning and the use of chloramines would only be used to produce additional water needed for sale (a reasonable assumption) and compare the net profits from the sale of water produced by both methods we find that at a frequency of cleaning of one year the net profit per day using chloramines would be $351.64 as against $158.48 without the use of chloramines.

At a cleaning frequency of three years and five months (the last point on Curves I and III) the daily net profit with the use of chloramines would be $345.50 as against $130.17 without the use of chloramines.

The above comparisons quite effectively show the economic soundness of the use of the chlorine-ammonia



Comparative Data on Cost and Quantity of Water Produced With and Without Chlorine-Ammonia Treatment
(Curves I & III without chlorine-ammonia. Curves II & IV with chlorine-ammonia)

treatment for increasing available water supply, in spite of the fact that the cost per mil. gal. produced will be greater than would be the case if cleaning alone were used.

All of the foregoing study has been based on the cost of cleaning and labor, materials, maintenance, and operation of the chlorine plant but not including any interest on the investment in the chlorine-ammonia plant and equipment.

Quite properly, a considerable part of the cost of treatment for maintaining carrying capacity could be charged to purification. Numerous customers along the supply would have made it desirable, if not absolutely necessary, to treat the supply for sanitary reasons.

It should be emphasized that the cost data as set forth in this study applies specifically to the 24-inch line at Utica, and that variation in cost of material, labor, water produced and selling price of water for any other line will give a different set of curves, although probably of the same general form. From the data presented, however, it is evident that the cost of using the chlorine-ammonia treatment could be much higher, the amount of water produced less, and the selling price of water lower within a considerable range and the treatment would still be economically sound as a means of producing additional water.

It will be noted that Item 7 in Table A records the installation of a booster pump at the head end of the 24-inch gravity line. By the use of this pump at the highest safe head possible, the line delivery was increased by one mil. gal., with the line in a partially dirty condition. The importance of clean pipe lines particularly at higher heads and velocities is indicated by Item 11, Table A, which shows that under gravity and pumping heads the line produced respectively 10.9 and 11.9 mgd. or a difference of 1 mgd. before cleaning. After cleaning, the line produced under gravity and pumping heads, respectively, 14.1 and 15.4 mgd. or a difference of 1.3 mgd.

Table A

STATISTICAL DATA FOR TWELVE MILES OF 24-INCH UNLINED CAST IRON PIPE AT UTICA, NEW YORK—1906-1948

Date	Remarks	Months Since Last Cleaning	"C" Before	"C" After	Delivery mgd. (1) Before	Delivery mgd. (1) After
1. June 1906	Line new	0	-----	135(2)	-----	13.6
2. Oct. 5, 1922	Cleaned	196	88	Oct. '22 128	8.8	12.8
3. Apr. 1, 1924	Cleaned	18	107	May '24 133	10.7	13.3
4. Aug. 27, 1925	Cleaned	17	104	Oct. '25 139	10.4	13.9
5. May 4, 1927	Cleaned	20	101	June '27 141	10.1	14.1
6. Aug. 6, 1929	Cleaned	27	100	Sept. '29 139	10.0	13.9
7. Dec. 23, 1930	Booster pump installed	17	107	107	10.7	11.7(3)
8. Jan. 3, 1931	Cleaned(4)	17	107	Sept. '31 130	11.7 10.7	14.2 13.0
9. June 16, 1933	Cleaned	29	104	July '33 134	11.3 10.4	14.6 13.4
10. Dec. 13, 1933	Chlorine-Ammonia treatment started	6	-----	-----	-----	-----
11. Apr. 8, 1934	Cleaned	10	109	Apr. '34 141	11.9 10.9	15.4 14.1
12. June 21, 1941	Cleaned	87	130	July '41 145	14.2 13.0	15.8 14.5
13. May 25, 1948	Cleaned	83	136	May '48 143	14.8 13.6	15.6 14.3

(1) Computed; Hazen-Williams formula for constant reservoir level or pumping head and actual pipe diameter of 24.2 inches.
(2) Conservative estimate for new coated C.I. pipe. (No measurement taken.)
(3) Shows effect of booster pump for increasing supply.
(4) Upper figures from Item 8 through 13 show delivery with booster pump; lower figures are for gravity flow.

How effectively the means set forth in this study, especially the chloramine treatment, have been in deferring the $713,000.00 construction program planned in 1924 may be judged by the fact that not until 1945-46, due to the war use, was it necessary to build any additional transmission line. At the present time an additional section of line is being built.

The expenditures on the 1945-46 and 1949 construction will total about $325,000.00, which is still less than half of that which it was estimated in 1924 would be necessary to expend to maintain supply. It is obvious, of course, that the direct comparison of current expenditures with 1924 estimates is a somewhat questionable procedure, but the comparison made in this way is still the more striking.

All of the recently laid transmission mains have been cement-lined pipe which will eliminate the possibility of tuberculation. However, since recent experiences with cement-lined pipe have demonstrated that cement lining does not necessarily prevent the formation of flow retarding slimes, it is planned to continue the chloramine treatment of the new lines.

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ILLINOIS STRENGTHENS STATE POLLUTION CONTROL AUTHORITY

The recent Illinois State Legislature strengthened the authority of the Illinois Sanitary Water Board. Long known for its effectiveness in the control of pollution, in the future the Board will have even more authority. The composition of the Board includes representatives of the Departments of Health, Conservation, Public Works, and Agriculture and a representative of industry. The Chief Sanitary Engineer of the State is the Technical Secretary of the Board.

The Illinois law gives the Board the right to define pollution and decide where it exists, and to prevent pollution by giving the Board jurisdiction over all substances and materials which pollute or threaten to pollute surface or ground waters.

The Board also may adopt and enforce rules for the submission of data relative to changes in sewer systems, provide for submission of operation reports for municipalities and industries, and set up qualifications for sewage works operators.

The amended law permits action in the Circuit or Superior Court by means of mandatory or prohibitive injunctions whenever the Board decides that a municipality or industry is not obeying the edict to abate pollution. The tightening of the law was supported by the Izaak Walton League, the Illinois Federation of Sportsmen's Clubs, was co-sponsored by a representative of both parties and was passed by both houses without a dissenting vote.

NEW PENNSYLVANIA SECTION MEETS

First Annual Meeting of A. W. W. A's. Newest Section in Harrisburg

by

HARRY A. FABER*
Editorial Associate
"WATER AND SEWAGE WORKS"

Chairman
E. C. Goehring
Asst. Mgr.
Munic. Authority
Beaver Falls, Pa.

Vice-Chairman
T. H. Kain
Manager
Columbia Water Co.
Columbia, Pa.

ONLY eleven months old, the Pennsylvania Section of the A.W.W.A. has 344 members and is seventh in size among the sections of the Association. This fact was emphasized by Dr. A. P. Black, National A.W.W.A. President, in his address at the Section's first meeting. Speaking at the annual banquet, Dr. Black predicted a great potential growth for the new Section and brought the best wishes of the entire A.W.W.A. membership. Special honor will come to the Pennsylvania Section in 1950 with the National Conference in Philadelphia.

The meeting was held in Harrisburg on September 14, 15, and 16, and registration reached 165. A full technical program included panel discussions of problems in employee security, distribution system maintenance and water coagulation. Several social events were provided, and a ladies' tour inspected nearby Hershey with its rose gardens and chocolate plant.

The Section chose **H. E. Moses,** Cons. Chief Engineer, Penna. Dept. of Health, to receive its Fuller Award. In announcing the selection, I. M. Glace, Chairman of the Award Committee, read the following citation: "For his long and distinguished career in the field of Sanitary Engineering and in the American Water Works Association; for his active leadership in improving the safety and quality of public water supplies; for his many contributions to the journals of the profession; and for his continuing inspiration to and patient training of young engineers."

Director-Elect
E. J. Taylor
Chief
Bureau of Water
Philadelphia, Pa.

Trustee
L. D. Matter
San. Engr.
State Dept. Hlth.
Harrisburg, Pa.

New Officers

The following officers were elected to serve for the coming year:

Director
Elbert J. Taylor,
Philadelphia

Chairman
E. C. Goehring,
Beaver Falls

Vice-Chairman
Ted H. Kain,
Columbia

Secretary-Treasurer
L. S. Morgan,
Greensburg

Trustee
L. D. Matter,
Harrisburg

TECHNICAL SESSIONS

The first two of four panel discussions were entitled "Service Materials and Service Main Construction," and "Policies Concerning Metering, Service Main Extensions and Shutoffs."

Leader of the discussion on materials and construction was **Charles P. Abraham,** Lancaster; panel members were **E. C. Goehring,** Beaver Falls; **G. V. Gustafson,** Wilkinsburg; and **John D. Johnson,** Erie. Pennsylvania communities generally employ copper for service lines up to and including 2 inch sizes, with the utility installing the main tap and the line to the curb of the property. In most instances, the consumer's installation must be made by a licensed plumber; where this is not a definite requirement, trouble has been experienced.

Mr. Abraham presided also at the discussion on metering and main extension, with **Walter H. Bottleson,** Verona, and **Carl I. Kear,** Minersville, as panel members. The adoption of meter boxes for curb installations was described as safe and facilitating meter reading. Such boxes or vaults are standard recommendations in some communities and are frequently employed in others where the service line is 100 ft. or more in length. It was generally agreed that the water utility should

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Secy.-Treas.
L. S. Morgan
Distr. Engr.
State Dept. Hlth.
Greensburg, Pa.

Program Chmn.
R. E. Stiemke
Prof. San. Engr.
Pa. State College
State College, Pa.

Panel Chairmen

C. P. Abraham
Supt. & Engr.
Water Dept.
Lancaster, Pa.

F. E. Stuart
President
Stuart Corp.
Baltimore, Md.

Program Participants

R. Ockershausen
Tech. Service
Genl. Chem. Div.
Edgewater, N.J.

R. N. Aston
Tech. Service
Mathieson Chem. Co.
Niagara Falls, N.Y.

T. R. Lathrop
San. Engr.
State Dept. Hlth.
Columbus, O.

F. B. Marsh
Assoc. Ed.
"Water Wks. Eng."
New York

own main extensions; under certain conditions, the applicant may be required to pay the cost of an extension, but will receive a return based on income from water use.

Fred E. Stuart, Baltimore, Md., led the panel discussion titled "Factors Affecting Coagulation and Flocculation." Members of this panel were **Richard W. Ockershausen,** Edgewater, N.J., and **Harry E. Holloway,** Midland, Pa. Mr. Stuart discussed the theory, practice, and control of coagulation, recommending a laboratory stirring machine with speed regulation as essential to the successful operation of water treatment plants. Mr. Ockershausen emphasized the influence of changing concentrations of algae and of alkalinity on alum requirements. Mr. Holloway discussed the practical value of adding lime in conjunction with alum at his water treatment plant. Discussers commented on the value of laboratory jar tests and the advantages of good water preparation.

Personnel Security Program

A panel discussion of particular interest was presented under the title "Security Programs for Water Works Personnel." This was ably led by **W. H. Markus,** Attorney, Pittsburgh, and included these participants: **K. A. Glenz,** Lemoyne, Pa.; **Thomas R. Lathrop,** Columbus, Ohio; **F. B. Marsh,** New York, N.Y.; and **George W. Naylor,** Apollo, Pa.

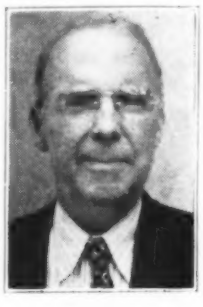
Panel members first discussed the "why" of personnel security, noting these values: "a secure employee does the best and the most work for the least cost," and "low employee training costs result when there is less turnover." Regarding "what" constitutes an ideal employee, it was stated that personal interest in a job well done, and employees who further good public relations are important in the water works industry. While salaries in water utilities are generally lower than in comparable industrial jobs, continuity of employment appears to make the jobs attractive.

Labor unions have been responsible for better salaries, whether employees are members or not (in Philadelphia), though seniority rules have already established job security. Unions will probably continue to expand, because employees recognize benefits which generally follow unionization and because civic employees feel better negotiations can be accomplished by group action. Programs of retirement income may be of the type effective in Ohio for State, County, City and Sanitary District employees. Benefits may start after 30 years of service, or after 60 years of age (or by larger salary deductions after 55), and amount to about three-quarters of the earned salary. State licensing of water works operators should eventually result in a higher operator qualification, probably at a justifiable increase in cost.

Pennsylvania Program for Clean Streams

"WHAT THE CLEAN STREAMS PROGRAM WILL MEAN TO PENNSYLVANIA WATER WORKS," a paper presented by H. E. Moses, Cons. Chief Engineer, Dept. of Health, Harrisburg.

He first pointed out that if a stream can be put into a condition suitable for water supply use, it will generally be suitable at the same time for recreational and industrial uses.



Honored
H. E. Moses
Cons. Chief Engr.
State Dept. Hlth.
Harrisburg, Pa.
(The Fuller Award)

Mr. Moses noted that about one-half the population of the state is concentrated along the Delaware and Ohio River basins in Pennsylvania. Wastes discharged to these streams include municipal sewage (typhoid fever is a "controlled" not a vanished disease) and industrial wastes (sewage treatment is well understood but industrial waste treatment is not). The State Sanitary Water Board has adopted the policy that all sewage and industrial wastes must receive at least primary treatment, and that secondary treatment must be provided as required. The municipalities ordered to prepare plans for sewage treatment now total 559, and the industries total 662. Funds of $4.25 million have been appropriated and $0.8 million has already been spent to further the program.

E. C. Trax, Chemist, Filtration Plant, McKeesport, and **John F. Kegebein, Jr.,** Norristown Water Co., Norristown, were scheduled discussors of the paper.

"An Unusual Water Supply Problem" was described in a paper prepared by J. D. Carpenter, Gannett, Fleming, Corddry and Carpenter, Inc., Harrisburg, Pa., and read by S. I. Zack of that firm.

This related an evaluation of available sources and water costs on an island in the Bahamas, where salt water intrusion reduced the supply available from wells. It was concluded that the development of large catchment areas, and the pumping of water to storage, would provide the necessary six-month requirement at the lowest cost.

Water Fluoridation

"THE STATUS OF WATER FLUORIDATION IN 1949," by Harry A. Faber, Research Chemist, The Chlorine Institute, Inc., New York, N.Y.

Mr. Faber described the background of this practice and reviewed the experimental applications of fluorides as a means of reducing tooth decay.

He also discussed official attitudes, and the evidence for and against water fluoridation.

[Ed. Note: Mr. Faber's complete paper appears elsewhere in this issue.]

Dr. L. G. Grace, Chief, Dental Div., Penna. Dept. of Health, Harrisburg, was the programmed discussor of the paper. He emphasized that no doubt exists as to the decay-preven-

Program Participants

E. L. Bean
Prin. Asst. Engr.
Water Bureau
Philadelphia, Pa.

S. I. Zack
Engr.
Gannett Engrs.
Harrisburg, Pa.

tive effect of naturally occurring fluorides, but that the value of added fluorides could be determined only when evidence becomes available from the experimental studies. However, now that the A.W.W.A. has provided a standard policy, Pennsylvania will probably be willing to permit empirical installations under suitable control. Since it appears that the value of water fluoridation applies almost entirely to children, Dr. Grace believes the cost of this practice should be computed on the basis of children who benefit; not on a per capita basis.

New Chester Supply

"Development of the New Water Supply for the City of Chester," by Francis S. Friel, Albright and Friel, Inc., Philadelphia, Pa.

Mr. Friel's paper was read by A. A. Estrada of the same organization. The problem required a study of sources which could provide at least 20 mgd. at present and 30 mgd. in the future of high quality raw water. The Delaware and Schuylkill Rivers and the Brandywine Creek were eliminated as suitable sources because of excessive pollution loads.

Octoraro Creek, with a potential yield of 75 mgd., is the source finally selected and approved. A dam will be constructed to provide 2.5 billion gal. of impounded water storage. The modern filtration plant will include facilities for tapered mixing and other novel features. Slides were shown to illustrate construction progress of the dam and filter plant.

Report on Chlorine Dioxide

"Recent Developments in the Chlorine Dioxide Process" described by Royden N. Aston, Technical Representative, Mathieson Chemical Corp., New York.

Chlorine dioxide has now been in use for over five years and has been applied in approximately 120 water treatment plants of the U. S. and Canada. Originally adopted for the control of phenolic tastes and odors, its scope is now recognized as more widespread.

Several laboratory studies have been reported concerning its bactericidal value, and recent field studies at the Niagara Falls, N.Y., water plant indicate it to be an effective disinfectant. For the destruction of bacterial spores, chlorine dioxide appears equal to chlorine when residuals are measured on an OTA basis. Mr. Aston explained that the orthotolidine test indicates one-fifth of the chlorine dioxide present.

He described a newly developed modification of the OTA test (in which oxalic acid is employed to reduce the free chlorine) making possible the separate identification of chlorine and chlorine dioxide residuals. He concluded that chlorine dioxide treatment has become an established process, relatively easy to install, simple to operate, and at least equal to chlorination in bactericidal effect.

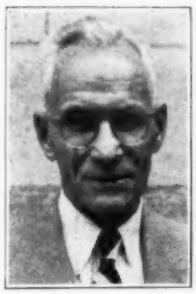
R. B. Adams, Supt. of Filtration, Wilkinsburg, and **B. French Johnson,** Chemist, Newcastle, discussed the paper. Mr. Adams presented a thorough description of the value of chlorine dioxide in control of medicinal tastes and odors at his plant. As long as the water temperature is above 60° F., chlorination accomplishes good disinfection without producing objectionable tastes. Activated carbon has been used for 15 years to control characteristic musty or sewage odors, and is not likely to be replaced. Chlorine dioxide has proved very satisfactory for treatment during cold water periods; it enables the chlorine dose to be adequate for disinfection without the formation of undesirable tastes and odors.

The discussion prepared by Mr. Johnson related to algae tastes and odors. At the New Castle plant heavy growths of algae have produced highly objectionable conditions; the tastes and odors from this source have been controlled more readily and more successfully by chlorine dioxide than by any other treatment applied. The ease of operation makes this method attractive and greater economy is expected as its use is continued.

Program Participants

A. A. Estrada
Engr.
Albright & Friel
Philadelphia, Pa.

C. I. Kear
Mgr.
Munic. Authority
Minersville, Pa.



Program Participants

*M. G. Mansfield**
Morris Knowles Inc.
Pittsburgh, Pa.

I. M. Glace
Cons. Engr.
Harrisburg, Pa.

*(*Mr. Mansfield continues as AWWA Director until the close of the 1950 Convention May 26, 1950.)*

Ozone Treatment at Philadelphia

"Preliminary Ozonation at Philadelphia," a paper presented by Elwood L. Bean, Prin. Asst. Engineer, Bureau of Water, Philadelphia.

He described and illustrated features of the installation by means of lantern slides, reporting operation and test results of only preliminary nature.

Dry air is produced by refrigerative and adsorptive units in series. Transformers step up the current of 460 volts to 15,000 volts for ozone generation. Ozone and air from the generators is discharged through carborundum plates at the bottom of a diffusion tank. There are 50 ozone generators, and each unit was guaranteed to produce 25 lb. of ozone per day; with 49 units in operation, the average production was found to be 28.2 lb. of ozone. The plant guarantee is also for not more than 14 kwh. per pound of ozone; in practice the current requirement has averaged about 10 kwh.

The greatest difficulty to date has resulted from incomplete adsorption of ozone in the diffusion unit. Ozone released at the surface sometimes carries to nearby residences. The diffusion tank has been covered and a 10,000 cfm. blower has been provided to dilute and disperse the released ozone to the atmosphere; if necessary, a stack will be added to make the dispersal more effective. Results of treatment indicate improved removal of tastes and odors in several instances; an 87 per cent bacterial kill is accomplished; and good removal of manganese is had with ozonation.

CLEANING OF PIPELINES WITH HYDRAULIC AND POWER METHODS

by

GEORGE ELLIS*
Flexible Sewer-Rod Equipment Co.
LOS ANGELES, CALIF.

THE pronounced economies made possible by cleaning pipelines, rather than replacing them, have only recently been impressed upon industry and municipalities. The awareness of the benefits which could be obtained gained strong impetus during the war when new pipe was so difficult to obtain. Now the advantages of what once was an emergency measure have been so thoroughly demonstrated that few companies or municipalities would consider replacing old pipelines whose only fault lay in a reduced carrying capacity.

The carrying capacity of pipelines may be impaired or, in extreme cases, completely lost for four major reasons. The reason can usually be determined by analyzing the type of water flowing through the line. Hard water, or water to which minerals have been added, causes an incrustation or "scale" on the pipe. Soft, reactive water will corrode the walls of the pipe itself, creating tuberculation. Waters which are unsterile, as from oceans or rivers, result in the formation of vegetation or "scum" in the line. Unfiltered waters deposit sediment in the line or cause wall incrustations of shale-like character.

There are two principal methods for correcting these conditions in the lines: the use of chemicals and mechanical cleaning. In most cases the former is eliminated because of economical and physical disadvantages. The latter may be resolved into two classifications: hydraulic and power cleaning.

Both types of mechanical cleaning of pipelines have been used successfully in preparing lines for coating with cement mortar. The hydraulic type has been used through 50-inch diameter pipe and the power type through 72-inch. The power method can safely be presumed to have no limits as to pipe sizes.

Mechanical cleaning gives 95 per cent or more of the carrying capacity of new pipe and cleaning costs are but a fraction of the cost of new pipe. If the cost of a lining job, which might last for thirty years, is considered as applied to cleaning, it is possible to clean for more than a hundred years and still have money left. The main advantage of lining is that it helps preserve the line by giving additional strength to the pipe and in stopping corrosion.

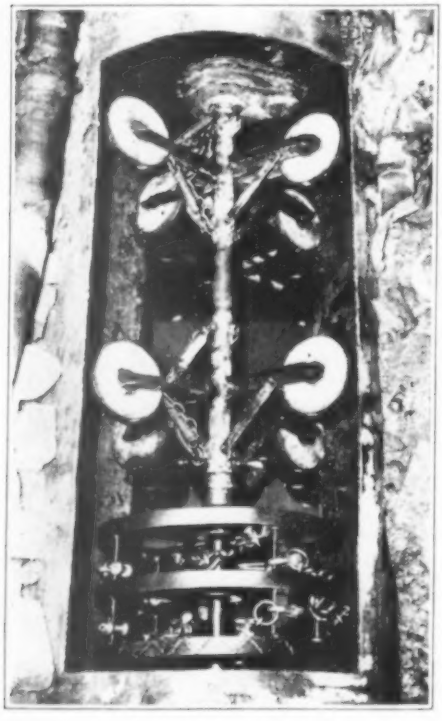
It may be pointed out that mechanical cleaning has also preceded the coal tar enamel method of lining pipes in place. It is true that mechanical cleaning does not offer the same efficiency as that of sand or shot-blasting but in certain cases can fulfill the requirements for enameling. The determining factor seems to be closely related to the pipe's interior condition, i.e., the extent of pitting.

Pipe which has been pitted up to 20 per cent has been cleaned mechanically and enameled. Inspection two years later revealed no breakdown and it is reasonable to believe that it should stand up for some time. Such was not the case with a line 80 per cent pitted in which most pits were found to be about $\frac{1}{16}$ in. in depth and $\frac{3}{8}$ in. in diameter. In cases where conditions are found unsuitable for mechanical cleaning, it is sometimes advantageous to clean mechanically before blasting, to aid in removing the majority of the foreign material. At present the chief advantage of mechanical cleaning is that its cost is much less than the cost for blasting equipment and labor for most in-place main rehabilitation jobs. In footage cleaned per hour, blasting is completely outclassed. Blasting is also limited to the larger sizes of in-place pipes.

Hydraulic Type Cleaning

Most hydraulic pipe cleaning tools are very similar in construction, differing mainly in size and cutter blade design. A typical 30-inch tool, at times referred to as a "pineapple or go-devil," could be described as a scraping device composed of five sections, each 30 inches long, with parts assembled in the following order: a right cutter head, a left cutter head, a saw tooth head, and two straight tooth heads with pusher plates attached. The center portion of each head is of cast aluminum, 12 inches in diameter with ends convex to give flexibility.

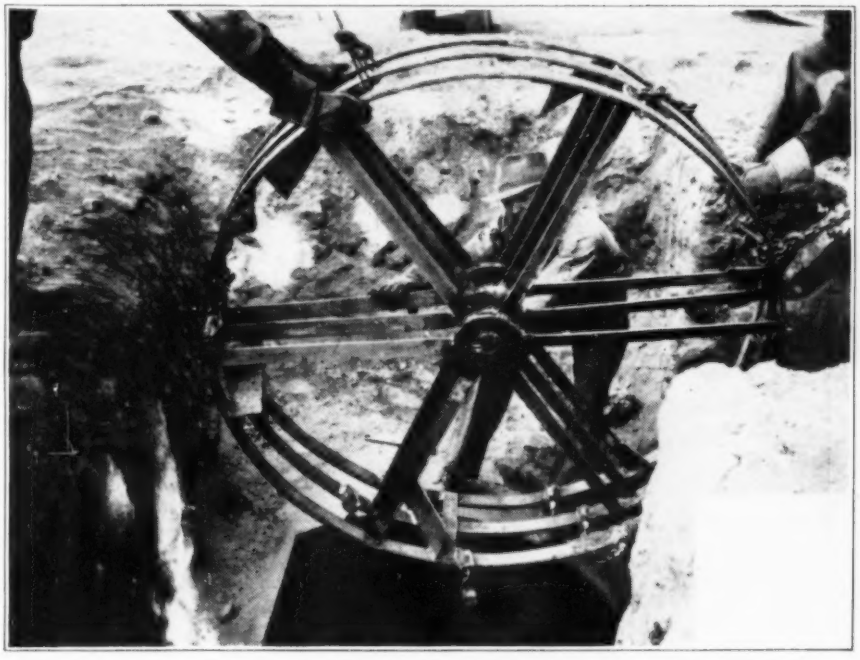
*Los Nietos Pipe Cleaning Div., Whittier, California.



Propeller Tool in 24 in. Line, With Carrier Used to Keep Tool Centered.
(Spokes create cleansing spray)

Chain-Head Tool at Rest and in Simulated Operation Below.
(Centrifugal force extends weights)

Three rings of flat spring-steel scraper blades, the ends ground to fit the pipes' curvature, are attached by Allen set screws to the center portion. A flexible steel rod, or cable, is threaded through the heads holding them together and allowing the heads to rotate and giving flexibility for rounding elbows. The blade shape of the right cutter head is beveled to the right and that of the left, to the left. The saw tooth head blades are designed to give a clawing action for cutting, while the straight blades scrape the pipe walls to a smooth finish. The straight blade heads are backed with a thick rubber disc for the water pressure to build up against. The tool may be assembled in the pipe by adding one head at a time and then jacking them into place, or the entire tool may be drawn into a spool and the spool returned to its place in the line. It may be pulled through the line by a cable but is usually propelled by hydraulic pressure working on the rubber disc.



A 72 in. Propeller Tool Being Inserted in Line.
(City of Los Angeles Job)

The line is sealed and the water or other liquid is applied to the correct volume and pressure to give the tool the required rate of travel. The tool emerges through an opened end riser at the end of the run. A travel of about 200 feet per minute seems to give the best results in cast iron or welded steel pipe, while about 125 feet per minute is used in riveted steel pipe. Most tools of this type permit a sufficient flow of liquid to by-pass the rubber disc and carry away the pulverized foreign material scraped from the pipe walls.

The hydraulic gradient, thickness and hardness of the foreign material determines the hydraulic force necessary to move the tool and the speed of tool travel. Here are a few examples of the speed and efficiency of this method: 14,000 feet of 14 in. cast-iron water main were cleaned of "scum" for the City of Flagstaff, Arizona, in 50 minutes starting with a pressure of only 15 psi. The volume of water carried was almost doubled and the working pressure halved in 9,000 feet of 20 in. main for the City of Glendale, Calif. Five pounds per square inch was used to move through 3,092 feet of 30 in. CI pipe for Standard Oil of California in 16 minutes. Twenty-six and one-half cubic yards of salt and mineral water scale was removed from seven miles of 8 in. steel line for Standard Oil of California in 2 hours and 40 minutes with a maximum pressure of 65 psi.

The greatest advantage of hydraulic cleaning lies in its linear range, which is almost unlimited, hindered only very slightly by bends. It does, however, require a more searching examination of hardness and thickness of the foreign deposits, for there is a limit to what this tool can do. Speed of cleaning can be closely controlled with this tool.

Power Type Cleaning

The power drive is equipped with a Willys motor, rated at 48 horse power, which is mounted on four 14 in. pneumatic tires. From the motor's transmission, power is carried by a chain drive to a second transmission connected to an outrigger shaft to which flexible rods are attached. A third transmission receives its power by chain drive from the motor transmission and controls the two rear driving wheels. To further aid the driving speed, a two speed clutch is added. The different rotational and linear speeds can be separately controlled through the use of the transmissions, clutch, and motor speed. The rotational speed ranges from 35 to 1350 rpm., while the average linear speed is 4 feet per minute. The wide range is very useful in performing the many tasks assigned it from rolling cable to cutting pipe. One man operates the machine.

The flexible rods, made of 1080 carbon steel in ½-inch diameter, are made in 24 foot sections. When the machine reaches the edge of the ditch or manhole, it is uncoupled from the rods in the pipe, backed up, and another section added to the spring. Two men operate the rod connecting. The average time necessary to complete the cycle of operation is approximately three minutes.

Tools Employed

The type of tool used depends upon the type of line to be cleaned; and, more especially, upon the thickness and hardness of the foreign material. Tools having pulverizing action which are used with excellent results are the so-called "propeller tool" for pipe diameters of 6 inches and above and the "chain head" for 4 to 12 inch pipe.

The "propeller tool," (so called because of its propeller-like action which helps pull itself) consists of two steel rings of ¼ in. mild steel, 4 inches apart and held by spokes from a round steel tube. To the two rings are attached 8 chain links with a lug, about the size of a one-inch nut, which is covered with stellite. The ring diameter increases with the pipe diameter.

The "chain head" is a round steel tube 12 inches long to which are attached six chains, the length of the chains being determined by the diameter of the pipe. On the end of the chains are lugs. Both of these tools are automatically centered by the centrifugal action of the twirling rod. For 24-inch pipe and larger diameters, a carrier is used to support the tool in the center of the line.

In the milling type of cleaning, the main tool used is the "hole opener." This tool consists of a round steel tube 18 inches long with from 4 to 9 circular steel discs mounted two inches apart perpendicular to the axis of the tube. These discs are notched to form a cutting bite, and are hardened. The discs get progressively larger in diameter from front to rear.

All these tools run *against* a stream of water or other liquid and the deposits are washed out to the entrance which is either shoveled or pumped clear.

Some examples which show the versatility of these tools and methods are 7000 feet of 2½ in. oilwell tubing cleaned for Standard Oil of California, 8000 feet of 10 in. JM "Transite" pipe for Phelps Dodge Corp., and 5000 feet of 12 in. clay pipe for Kaiser Steel. In the first example, the tubing was racked and in joints of 21 feet with a scale predominately calcium compounds and limestone. A hole opener was used and the job completed in 5 days at a cost of nine cents per foot. The replacement cost would have been 54 cents per foot, if available. In the second case mentioned, the "Transite" pipe in use at a copper concentrator was almost ¾ filled with incrustation. A hole opener was used measuring 9¾ in. OD and the work was completed in 7 days. In the last case the clay pipe was choked with mill scale. A propeller tool was used to stir the scale up, allowing the water to wash it out after opening a hole through it. This job was completed in 8 days.

The main advantage of mechanical cleaning lies in the fact that neither type of pipe, diameter, foreign material present, or thickness cause much concern except in deciding the type of tool to be used and the best speed combination involved.

Its limitations are in length of run (average distance of 1500 feet for smaller diameter pipe and 900 feet for larger pipes in eight hours) though it has been used over 2000 feet in 48 in.; restrictions caused by angles and bends (this depends on type, size of pipe, and radius of curve); and location of pipe to be cleaned. A runway of 40 feet in length and 6 feet wide is needed to operate the equipment. If the line is located six feet or more below the ground surface, a guide pipe or heavy walled hose of 2 in. ID must be placed at a 45° angle with the surface to lead the flexible rod into the line.

Mechanical Dragging or Scooping of Sewers

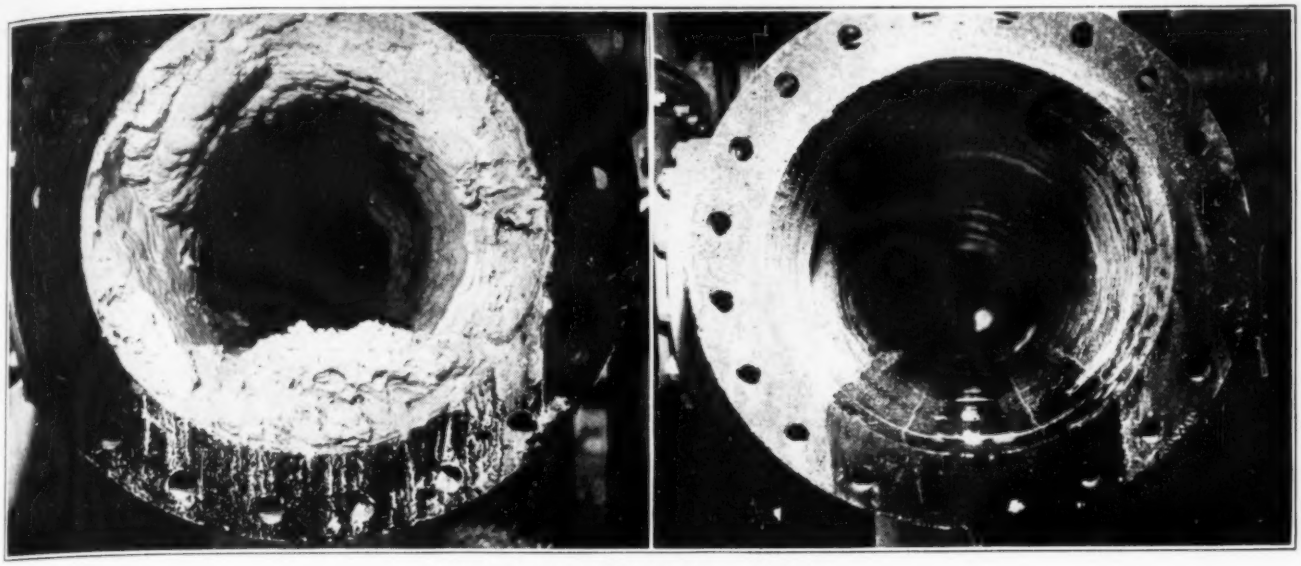
In recent years so called "bucket machines" have been used with much success for specific jobs. The general layout of a typical installation utilizes two power winches set over two manholes on the line approximately 600 feet apart. From the loader, winch A, a cable, usually ¼ in., runs from the winch around a manhole jack placed at the bottom of the manhole through the pipe and to the "self-loading" bucket. A second cable runs from the bucket around a manhole roller jack and up to a pulley above the puller, winch B, and hence to the winch.

The operation starts with winch A pulling the bucket into the line. The pull on the bucket in this direction causes the bucket's mouth to be held open allowing it to "bite" into the foreign material. When the bucket is loaded, winch A stops pulling and winch B begins pulling in the opposite direction. This pulling causes the bucket's mouth to close, trapping the load. Winch B pulls the bucket out of the line, around the roller jack and up to the pulley where it is caught and held by a stationary hook, allowing winch B to release its strain. The bucket is swung to one side and by means of a strain placed on the cable from winch A with a hand hook, the bucket is dumped. The stationary hook is released after swinging the bucket back into line with the manhole and winch A pulls it back around the roller jack and into the line for another load.

One man is used at winch A and two men at winch B. The average cable speed used is 130 feet per minute using a one cubic foot bucket. A number of different diameter buckets are used depending on pipe size to be cleaned.

In this article we have attempted to

A Power-Bucket Machine Cleaning a Sewer.
(The bucket not clearly visible has just been dumped in front of the man-hole.)



A 20 in. Industrial Line Before and After.
(Carrying capacity restored; line good as new.)

give the reader some aspects on cleaning, from an economical viewpoint, to show its physical advantages and disadvantages, and the general methods employed by the several firms specializing in pipe cleaning. The field of cleaning is still in its childhood but progress is being made yearly. Industries such as mining and steel have in the past few years looked increasingly to mechanical cleaning for aid. The cleaning companies are at present trying to increase their efficiency, develop methods for cleaning pitted lines, improve the effectiveness of portable blasting equipment, and generally are working for lower operating costs with greater efficiency. Mechanical cleaning followed by intelligent water treatment offers the best solution for most existing problems.

Mark Owen Opens Consulting Office

Announcement has been made of the opening of a consulting engineering office by Mark B. Owen. Mr. Owen will have associated with him Robert L. Meek. Their office will be located at 1920 North Meridian St., Indianapolis 2, Ind., and they will specialize in the incineration of municipal and industrial refuse, industrial waste treatment, sewerage, water supply and related engineering problems. Mr. Owen was formerly a member of the firm of Russell & Owen of Indianapolis, and prior to that time was associated with the Nichols Engineering and Research Co. of New York City.

M. A. Pond Heads New Div. of Engineering Resources in U.S.P.H.S.

The Federal Security Administrator has announced the creation of a new division in the Bureau of State Services, Public Health Service, to be known as the Division of Engineering Resources. Appointed chief of the new division was M. Allen Pond, Asst. Chief Sanitary Engineer of the Public Health Service. The purpose of the new division is to evaluate activities and more clearly delineate needs in environmental health, according to Surgeon General Leonard A. Scheele. The new Division of Engineering Resources will centralize planning and development of current and proposed programs of the Public Health Service in the expanding field of sanitary engineering and environmental health.

Main Cleaning Project Important to Industrial Production

At the Dan River Cotton Mills, in Danville, Va., the cleaning of a 20-in. supply line was of utmost importance to maintain production. Speed of cleaning was also of most importance. Because of the limited storage of finished water and the fact that this was the only line of supply, it was necessary to clean the main within a period of eight hours.

Not only was speed of importance, but it was also necessary to run the cleaning tool against the normal flow of water. In order to make the cleaning project in the limited time available, a whole day was spent in preparation. An M-Scope was used to locate and stake out the path of the 3,000 ft. line. Two-way radio communication was used in both the preliminary work and the actual cleaning. Dresser Couplings were used to couple the pipe where it was cut for the entrance and exit of the cleaning machine.

The work was performed in a period of 7½ hours by the National Water Main Cleaning Co.

Two More Basin Engineers Appointed In U.S.P.H.S.

Ten out of the fourteen basin engineers have been appointed by the U.S. Public Health Service in the Water Pollution Control Division under Carl M. Schwob.

The most recent appointments are Kenneth C. Lauster as Chief Basin Engineer of the North Atlantic Drainage Basin, with headquarters in New York City, and W. Waldo Towne as Chief Basin Engineer of the Ohio and Tennessee Drainage Basin, with headquarters in Cincinnati, Ohio.

Mr. Lauster came to the Public Health Service in 1945 from the North Dakota State Dept. of Health, where he was Chief Engineer of the Division of Sanitary Engineering. In recent years he has been Executive Officer of the Water Pollution Control Advisory Board.

Mr. Towne, who was formerly Director of the Division of Sanitary Engineering of the South Dakota Dept. of Health, will have the task of developing working relationships with the Ohio River Compact Commission and the Tennessee Valley Authority. He will assist states lying in the Ohio and Tennessee Drainage Basin area in developing comprehensive programs aimed at preventing or abating pollution of the basin's water resources.

IOWA SEWAGE WORKS ASSN. ANNUAL MEETING

THE Thirty-First Annual Meeting of the Iowa Sewage Works Assn. was held in Des Moines, Iowa, September 20 to 22. Organized originally as the Iowa Waste Disposal Group, its growth in membership was small until the past few years. Now with a membership of 115, it is a rapidly growing organization.

The interest in the growth and the meetings of this organization is well evidenced by the fact that 105 persons attended the meeting, most of these being members of the association itself.

Editor of the *Iowa Sewage Works Digest* is L. F. Skorczeski, Supt. Sewage Treatment, Marshalltown, Iowa.

The addresses of welcome to the group were given by Heck Ross, Mayor of the City of Des Moines, and by Arthur Brayton, Manager of the Convention Bureau of the Des Moines Chamber of Commerce. The response was made by the chairman Lloyd J. Heller, Chief Engr., Sewage Works, Fort Dodge, Iowa.

Electrical Equipment Maintenance

"CARE AND MAINTENANCE OF ELECTRICAL EQUIPMENT" by C. C. Doerrie, Field Engr., Westinghouse Electric Corp.

Mr. Doerrie stated that the maintenance of electrical apparatus is vitally important to the proper operation of any treatment works. Studies of maintenance records by the Westinghouse Electric Corp., have indicated four causes of failures in electrical equipment. These are as follows:

(1) *Dirt.* Dirt contains smoke, chemicals, and floor dust. Electrical equipment can be kept clean by wiping, by dry compressed air at 30 to 50 psi., or by cleaning with "Stoddard" solution. For exceptionally heavy greasy dirt, mixtures of Stoddard solution and carbon tetrachloride may be employed. Mr. Doerrie explained the methods which his company uses to protect equipment against the ravages of dirt.

(2) *Moisture.* All electrical equipment should be kept dry, as moisture is one of the principal causes of failure.

(3) *Friction.* Friction likewise is a cause of failure of electrical equipment. Oil in bearings will pick up chemicals from air, and ball bearings may pick up dust. Both of these will increase friction and cause corrosion.

(4) *Vibration.* Misalignment is a cause of vibration and a frequent cause of electrical equipment failure.

Safety

"HEALTH AND SAFETY PROBLEMS" by H. S. Smith, Cons. Engr., the Stanley Engineering Co., Muscatine, Iowa.

Mr. Smith argued that all operators should develop an acute sense of safety mindedness. This includes not only posting of safety slogans, keeping equipment in proper operation and providing proper safe guards, such as gas masks, etc., but the actual thinking of safety.

Mr. Smith believes that the design of the treatment works should be such as to eliminate or to minimize hazards, that operators must maintain the safety features and that operators must recognize hazards and learn to live with them.

Regarding the hazards present in a sewage plant, Mr. Smith called attention to sewage itself, and the hazards of physical and electrical equipment and gas. Regarding the health hazards, it is highly proper that one observes simple health rules and cleanliness. As regards equipment, it is well for the operator to list sources of hazards. It is important to keep gas and oxygen apart, to avoid hydrogen sulfide, to avoid pits, to provide positive ventilation, and the operator should not depend on his nose to detect gas concentration.

In discussing this paper from the floor, **Dr. George E. Symons,** Associate Editor, *Water & Sewage Works,* called attention to Manual No. 1 of

Presidents

Incoming	Outgoing
Paul Bolton *Asst. Engr.* *Iowa H'lth Dept.* *Des Moines*	*Lloyd Heller* *Chief Engr.* *Sew. Works* *Fort Dodge*

Officers 1949-50

Vice President	Secretary-Treasurer	Federation Director	Editor Iowa Digest
Carl Borland *Supt.* *Sew. Works* *Mason City*	*Leo Holtkamp* *Supt.* *Sew. Works* *Webster City*	*John Strelow* *Supt.* *Sew. Works* *Davenport*	*L. F. Skorczeski* *Oper.* *Sew. Works* *Marshalltown*

Officers

Officers elected for the ensuing year were as follows:

President
Paul Bolton
Asst. Engineer
Iowa State Dept. of Health
Des Moines, Iowa

Vice President
Carl Borland, Supt.
Sewage Works
Mason City, Iowa

Secretary-Treasurer
Leo Holtkamp, Supt.
Sewage Works
Webster City, Iowa

Directors
W. E. Galligan, Prof.
Sanitary Engineering
Iowa State College
Ames, Iowa

H. S. Smith
Stanley Engr. Co.
Muscatine, Iowa

Federation Director
Paul Houser, Chief Engr.
Iowa State Dept. of Health
Des Moines, Iowa

Programmers

Paul Houser
Director
Pub. H'lth Div.
Iowa H'lth Dept.
Des Moines

M. O. Nelson
Dist. Engr.
Pub. H'lth Div.
Iowa H'lth Dept.
Council Bluffs

the Federation of Sewage Works Assns. on Safety Practices. He also mentioned that the subject of safety is of vital importance to sewage plant operators, this importance being evident by the fact that at four out of five conventions which he had attended in recent months the subject of safety was on the program.

Jack J. Hinman, Consultant, Ames, Iowa, spoke of possible contamination by tropical diseases brought back during the war.

Informal Group Discussion

One innovation at this meeting not seen elsewhere was "Over the Coffee," an informal group discussion. This included Imhoff plants with the discussion led by **Fritz Heiffer** of the State Dept. of Health; separate sludge digestion plants, with leader **Paul Bolton** of the Dept. of Health, and activated sludge plants with **Harland Rix,** also of the Dept. of Health, as the leader. These groups were seated at separate tables where coffee was served. In addition, there was a miscellaneous group at which a number of persons and manufacturers' representatives sat and discussed such items as chemical precipitation plants, the new Daytona Beach process and the work being done by Infilco at Elmhurst, Ill.

At this session, too, Jack J. Hinman showed colored slides and talked about his experiences in Japan. Most of the slides where concerned with excreta disposal as it is done on the islands of Japan.

Also appearing at this session in an unscheduled discussion was **Arnold H. Haverlee** of the Cloroben Corp., Jersey City, N.J. Mr. Haverlee referred to the work of Rolf Eliassen, and spoke of the use of "Cloroben" as an up-sewer treatment with a selective action.

In addition, Mr. Haverlee told of experiments now being made at the inlets to plants and at Sheboygan, Wis., where 1 ppm. of "Cloroben" had been added directly to digesters. Experiments are also being made on the use of "Cloroben" with tannery waste. Mr. Haverlee diagrammed the dosing stations system which is being used in the Southwest and in California. He explained how the material is added to the sewers and told of several of the reasons for its effectiveness in controlling production of hydrogen sulfide.

Sedimentation Tanks

"Operation and Maintenance of Settling Tanks" by R. G. Dagg, Chain Belt Co., Chicago, Ill.

Mr. Dagg introduced his talk with the statement that the detention period alone is not the sole criterion for the design of the sedimentation tanks. Such factors as distribution of flow to tanks at proper velocities, and overflow rates are also important. He pointed out that performance of sedimentation tanks is affected by effluent weir arrangement, several of which he described.

More Programmers

Jack J. Hinman
Consultant
Ames, Iowa

H. A. Smith
Cons. Engr.
Muscatine, Iowa

Mr. Dagg also spoke of sludge removal and how scraper mechanisms operate, also the proper procedures for pumping the sludge. Among the things intelligent operators should do to remove scum with a minimum of excess water is to take full advantage of all flexibilities of plants and facilities, to keep the effluent weirs clean, maintain equipment properly, keep full records and to study these records and plant data regularly. Mr. Dagg also believes that in sedimentation, equipment should be dewatered and that sludge removal equipment inspected at least once every 8 to 12 months.

Trickling Filters

"Developments and Maintenance of Filters" by Oliver F. Barklage, Infilco, Inc., Chicago, Ill.

Mr. Barklage opened his paper with a discussion of the trickling filter as an oxidizing device and explained its operation and its history in this country. He pointed out that filters have little mechanical equipment to maintain and have the added advantage that they will take shock loads.

Mr. Barklage also reviewed the several types of high rate filters and discussed combinations of re-circulation principles. He suggested a need for standardization of trickling filter loading, terminology and cited results obtained with high rate filters.

In connection with suggestions for operation, he spoke of ponding and what to do about it, maintenance to prevent nozzle clogging, treatment to eliminate filter flies, and prevention of icing. According to Mr. Barklage, icing does not occur when the wind is not blowing. One installation was described where a windshield was set around the filter, and it was thus prevented from freezing for the entire winter.

As did many other speakers on the subject of equipment, Mr. Barklage emphasized the need for good laboratory and operating records. **H. W. Gillard** also of Infilco, Inc., explained the origin of the Daytona Beach process which utilizes the Infilco "Accelator" with water softening plant sludge as a means of treating sewage. He also told of the experiments at Elmhurst, Ill., where aeration is employed together with an "Accelator" unit. The results of these experiments indicated that operation was better than expected and thoroughly equal to secondary treatment.

Stream Pollution Laws

S. C. Martin, Basin Engr. of the Great Lakes and Upper Mississippi Drainage Basin, Stream Control Div., U. S. Public Health Service, reviewed Public Law 845 and its application to the problems of pollution in Iowa as well as other states.

Paul Houser, Chief Engr., Iowa State Dept. of Health, reviewed the Iowa State Pollution law, the history of the passage and the provisions of the most recent bill which was passed in February, 1949.

Mr. Houser also showed a map on which was indicated the status of sew-

And More Programmers

R. G. Dagg
Engr.
Chain Belt Co.
Chicago, Ill.

John Sperry
Vice Pres.
Walker Equip. Co.
Aurora, Ill.

age treatment works installations in the state of Iowa. It was obvious from the map that a great many such installations had been made within the past ten years. This has undoubtedly contributed to the growth of the Iowa Sewage Works Assn.

Engineer-Operator Relationships

"Relationships Between the Engineer and the Operator" by H. H. Hennigson, of the Hennigson Engr. Co., Omaha, Neb.

In Mr. Hennigson's absence his paper was presented by Charles Durham a member of the firm. Mr. Durham pointed out that in small communities facilities for sewage treatment were almost lacking to encourage good operation. Among the causes for poor operation is a lackadaisical attitude of town councils and poor or obsolete equipment. He also blames the failure of engineers to follow up a job, and the failure of city councils to see the need for engineering interest after construction.

Other problems might arise from the fact that while the operator may operate a plant to produce results, such operation may not suit the original design. Furthermore, many engineers do not know or understand operating problems. Mr. Durham believes that the contract should call for a period of operation by the engineer. He also believes in the need for licensing operators and the need to educate town councils to understand the importance of trained operators.

Financing Sewage Works

"Financing of the Building and Maintenance of Sewage Works and Sewer Systems by Sewer Rental Methods and Special Assessments" by Carleton D. Beh, President, Carleton D. Beh Co., Investment Securities, Des Moines, Iowa.

Mr. Beh reviewed in detail the provisions and codes of the Iowa laws regarding sewer revenue financing and special assessments financing for the construction and operation of sewage treatment works.

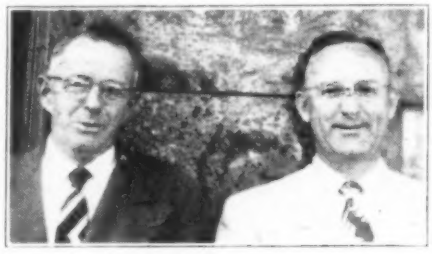
The Paul Winfrey's
(He's Supt., Sewage Works, Des Moines, and Past Pres. of Iowa Sew. Wks. Assn.—She was Chairman of the Ladies' Program)

Digester Sludge Heating

"New Developments in Digester Sludge Heating" by Don Walker, Pres., Walker Process Equip. Co., Aurora, Ill.

In the absence of Mr. Walker his paper was read by **John Sperry,** Vice Pres. of the Walker Process Equipment Co., Aurora, Ill. Mr. Sperry traced the improvement of the disposal of solids from the day of the Imhoff tanks and the separate sludge digester to the modern day practice of heating sludge by external heat exchangers. He referred to the installation at Webster City, Iowa, as typical of the newer type of heating equipment.

Mr. Sperry also explained the several different methods of heating sludges, including the use of direct steam, submerged gas burners, radiant heat and hot water external heat exchangers, as well as the old type hot water coils.



Also on Program
H. W. Gillard, Chicago, Ill.
O. F. Barklage, Omaha, Neb.
Infilco Co. Representatives

For external heat exchangers, it is important that the flow of both water and sludge be of the turbulent flow variety. It is also important that there be simple controls for the burner. Use of these external heat exchangers allows for recirculation of sludge in the tank, and important considerations to good digester operation. From ¼ to ½ of the contents should be recirculated per day. Mr. Sperry pointed out that with external heat exchangers it is possible to start a digester quicker and that there is no longer any need to enter digesters.

He discussed recirculation and its relation to withdrawal of supernatant liquor, pointing out that there are now on the market devices for aiding in the withdrawal of good supernatant liquor. These are the "Supernatant Selector," developed by the Pacific Flush Tank Co. and the new "Superdraw" device developed by the Walker Process Equip. Co. Mr. Sperry diagrammed this new device upon the black board.

Program

C. W. Durham
Cons. Engr.
Hennigson Co.
Omaha, Neb.

A. H. Haverlee
Engr.
Cloroben Corp.
Chicago, Ill.

Operators' Breakfast

Under the chairmanship of **M. O. Nelson,** Engr., State Dept. of Health, Spencer, Iowa, an Operators' Breakfast and Question Period was held on the last morning of the meeting. The topic which occupied most of this discussion was scum in digestion tanks, and the operation of digestion tanks. It was suggested that one means of preventing scum formation in tanks was to keep the grease out of the tank. **Paul Winfrey,** Supt. Sewage Treatment at Des Moines, Iowa, reported that they skimmed grease from the primary tanks and sold it. Although they are still able to sell it for ¾ of a cent a pound, there is not a great deal of interest on the part of the buyers.

Lloyd Heller, Supt. at Fort Dodge, Iowa, stated that they operated their digestion tanks at 114 deg. F., and pumped the grease to the second stage digester with little difficulty. On the other hand, **Leo Holtkamp,** Supt., Webster, Iowa, stated that he was unable to obtain enough gas to bring the temperature of the digesters much above 76 deg. As a result he is bothered with six feet or more of scum. **W. D. Hebig,** Supt., Cresco, Iowa, reported that he covered the floating covers with straw to insulate them during the winter.

Another topic which received somewhat lively discussion was the matter of automatic control for gas burners but particularly in reference to heat exchangers. **Paul Bolton,** Engr., State Dept. of Health, Des Moines, Iowa, said that it sometimes took an extra man to keep the automatic controls automatic. **George Ahrens,** Asst. Supt., the Water Dept., Ottumwa, Iowa, former sewage plant operator, stated his belief that too often the diaphragm gas controls do not work. Where controls stand inoperative for long periods of time they are apt to corrode. They should be tested at regular intervals. He prefers the Detroit Lubricator control, an opinion which was concurred in by Lloyd Heller of Fort Dodge, Iowa.

Non-Programmed Registrants

S. C. Martin
Basin Engr.
U.S.P.H.S.
Chicago, Ill.

R. V. Coonradt
Supt.
Sew. Works
Osage, Iowa

The question was also raised about possible effects of atomic waste in sewers and the questioner was referred to Arthur Gorman, Sanitary Engr. of the Atomic Energy Commission, Washington, D.C.

Inspection Trip

One of the features of the meeting was an inspection trip to the plant of the Iowa Pipe & Tire Co. in Des Moines, where Cummins Rawson, Albert C. Rawson, Jr. and Thomas Rawson acted as guides through the plant. All steps of the operation were shown.

Banquet and Entertainment

At the annual dinner W. H. Wisely was scheduled to speak, but was unavoidably absent to attend the Georgia Water and Sewage School.

Ladies' Committee

Mrs. Paul Houser, Des Moines
Mrs. Carl Borland, Mason City
Mrs. Paul Bolton, Des Moines

Non-Programmed Registrants

D. R. O'Hare
Wallace & Tiernan
Des Moines

C. W. Hamblin
Commissioner
Mason City

In his absence **Jack J. Hinman,** former Prof. of Iowa State University, spoke on the foundings of the Iowa Association and of the Federation. **George E. (Doc) Symons** also appeared as an after-dinner speaker, giving one of his verbal "Here and There Columns" with his reading glasses routine.

"The Dorr Way"

First Showing of Dorr Co. Film

At a premier showing, on Nov. 2, the Dorr Co. presented its new motion picture "The Dorr Way" before more than a dozen editors of technical publications. "The Dorr Way" is a three reel (33 minutes) 16-mm. motion picture in color with sound which tells the story of a man, Dr. J. V. N. Dorr; an idea, the "mechanistic" treatment of finely divided solids suspended in liquids; and an organization, the Dorr Co. and its associated companies and representatives throughout the world.

The film opens with Dr. Dorr standing in his company's main office. Before him is a 4-ft. globe of the world upon which vari-colored pins denote the locations of projects engineered by his organization. This scene dissolves to show 17-year-old John Dorr working in the laboratory of Thomas Edison, and there follows a quick succession of scenes showing the site of the original installation of the first Dorr classifier in So. Dakota; the modern laboratories of the Dorr Co. at Westport Mill, Conn.; and other views showing the principles of the units which Dr. Dorr invented.

Other sequences show the company's chief fields of industrial activity today: mining of gold, copper, aluminum; production of chemical fertilizers, sand, magnesia, chemical pulp, and cement; and sanitary engineering. This latter sequence shows installations of Dorr sewage treatment equipment in New York, Chicago, London, Paris, and Berlin, as well as industrial waste installations. Also shown are many installations for the treatment of water for domestic consumption and irrigation purposes.

The film was directed by Nell Dorr (Mrs. J. V. N. Dorr) a photographer in her own right and author of "In A Blue Moon," a book of photographs. The film was photographed by Erica Anderson, who has done several documentaries. The script was by Alfred Stern, and the score by Kay Swift. Mason Adams acted as commentator. Shooting included more than 100 scenes here and abroad, by director and cameraman, often accompanied by Dr. Dorr and staff who travelled more than 6000 miles. The final film consists of 1200 feet carefully selected from a total of 17,000 feet. The project took more than a year and a half to complete.

A "Super's" Bad Dream

SHE—"It must be some of that 'activated charcoal' that the paper said was to be put in our water to make it smell and taste better."

"Fish To Fur Coats"

Mink ranching, once a flourishing industry around Lac La Biche, Alberta, Canada, has waned as the result of the dying off of white-fish in the area.

White-fish, which constituted the principal food of the mink, have died off because of oxygen deficiency in the lake water. The oxygen deficiency has been attributed to decay of weed growths on the lake bottom.

Who would ever have connected dissolved oxygen with fur coats. Quiz masters take note!

Mississippi Basin Model

A scale model of the Mississippi River Basin is being constructed at Clinton, Miss., just west of Jackson, Miss. When completed, the basin will cover 200 acres and measure 4500 ft. in an east-west direction and 3900 ft. in the north-south direction. Scale for the model basin is 1 to 2000 horizontally to 1 to 100 vertically. The model is being built by the Army Engineers of the Waterways Experiment Station. When completed it will be able to simulate flood conditions of any kind or type ever experienced on any of the rivers in the Mississippi Basin.

Of course water plays a part in both the construction and operation of this huge model. Up to 1000 gpm. of water will be required to operate the model when completed. Studies made on this model will help to eliminate or control floods which have, on many occasions, practically wrecked water supplies.

FLEXIBLE SEWER PIPE JOINTS

Permit Sewer Construction in Water Filled Trench

by

REUBEN F. BROWN
Superintendent
SEWER MAINTENANCE AND OPERATION
LOS ANGELES, CALIF.

A RECENT development of proven performance, permanency, and trouble-free pipe line installation is now used to reduce sewer maintenance costs. A flexible sewer pipe joint is one of the dreams of engineers and superintendents of sewerage systems charged with providing better sanitary conditions in a community. Such a pipe joint has been provided by the Pacific Clay Products Co. of Los Angeles, Calif. It is the "Ceramicweld" pipe, couplings, and fittings. Due to serious water conditions, heavy swelling adobe soil, and shallow covering with danger of vibrations, over 5,000 feet of "Ceramicweld" pipe and couplings were installed by sewer maintenance forces of the City of Los Angeles. This pipe coupling will bend or give to an extent of 4 to 6 inches. It is made of rubber which will resist acid, alkali, greases and solvents in sewage and temperatures in excess of those normally encountered in sanitary sewers or industrial waste lines.

This rubber coupling fits to the butt end of a plain end clay pipe as shown in the accompanying pictures. It has steel compression bands on the inside which are screwed up with a speed wrench after the pipe has been coupled and is in position in the trench. There is a rubber ring cushion between the joints of pipe which extends over the ends of both pipes. It is pushed into place very easily, and when tightened up makes a mechanically compressed joint, so that all parts are sealed in and protection is provided against gas, water, roots, and other substructural damage.

Close-up of Jointing Coupling

The gasket is held tight on plain end clay pipe by steel bands tightened by turning up two nuts inside the gasket.

This pipe can be laid under water without any danger of weakening the joint. The rubber joint gasket is filled with cement mortar which is poured after the pipe and coupling is in place. It is not necessary to leave the last two or three joints open as is customary in laying pipe so cement joints will not crack, as the last joint may be moved 4 to 6 inches without endangering the tightness of the flexible, shock-proof rubber connection after the gasket is filled with cement mortar.

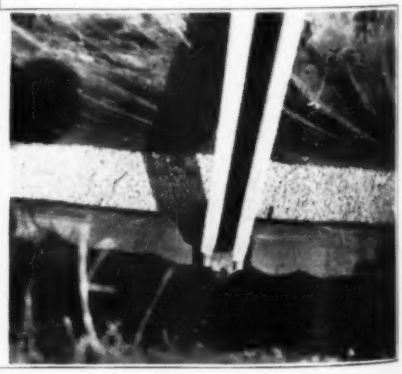
Another feature of the flexible rubber joint is that it fits on to the butt ends, or what is commonly known as spigot end of a pipe, the bell end of the pipe not being required. The pipe can be cut very easily to insert Y's for house connection sewers at any desired location. This provides minimum waste of pipe as short sections are very often needed to bring the pipe up to the required station.

It was found in laying the 5,000 feet of "Ceramicweld" pipe and couplings that a much speedier and better installation was secured than normally could have been expected if bell and spigot pipe had been used. One hundred per cent tight joints were obtained, laying the pipe and rubber coupling with water nearly covering the top of the pipe. No leaks were found in any of the 5,000 feet of pipe laid. Two to three hundred feet of trench were opened at one time and one crew was able to lay the pipe as fast as the trench was excavated.

It was also found that the ends were protected against impact by the rubber cushion formed over the ends of the pipe. The space between the

Close-up of a Y in Place with Rubber Gasket Joints. The Joint Gaskets Are Left Open Until Filled with Cement Mortar.

300 ft. of Flexible Jointed "Ceramicweld" Pipe and Fittings in Place. Note Grade Stake and Line Used for Pipe Laying.



This Chute Is Used to Fill the Gasket with Cement Mortar from the Top of the Trench.

ends of the pipe being filled with rubber, a smooth flow line was obtained which prevented solids from lodging in the spaces between the pipes, generally encountered in the ordinary bell and spigot joint. Tight joints and flexibility were insured by tightening up on the steel compression band couplings, shown in the pictures, before filler of any kind was poured into the rubber coupling. A hundred feet of pipe were laid at a time, the joints remaining open with nothing but the compression bands holding the rubber gaskets in place. Cement mortar was then mixed and all the couplings in the hundred feet of pipe were poured at once. This allowed a reduction in personnel, as the same crew laying the pipe to grade and line came back and mixed and poured cement mortar into the rubber couplings.

It is our belief that "Ceramicweld" pipe couplings and fittings is a forward step in the installation of sewer, storm drain, and industrial waste lines. Due to the acid resistance of the rubber and the flexibility of the joints, it seems to answer a great many of the problems that cause serious difficulties in the maintenance of these pipe lines.

Such factors as the prevention of infiltration and exfiltration by tight sewer lines; the safety in laying sewer lines near domestic water supply lines; and simple construction and good performance in areas subject to excessive ground water, subsiding or heaving ground, vibration, expansion and contraction, and root penetration (all made possible by the use of these materials and methods) provide an advance in the construction, maintenance and operation of a sewerage system.

A New Cast Iron That Bends

Believed Greatest Single Advance in Cast Iron Field in Over a Century

Industry now has available to it a new cast iron which, unlike ordinary cast iron, is not brittle but can be bent or twisted. It is probably the most outstanding metallurgical development in the foundry industry since around 1820, when Seth Boyden first made, from cast iron, the American type of malleable iron at Newark, N.J. The novel product, popularly known as ductile cast iron, has several times greater strength than ordinary cast iron with greatly increased ductility and shock-resistance.

These facts were presented last month by Don Reese, well-known foundry expert and engineer, before the annual meeting of the Gray Iron Founders' Society in Chicago.

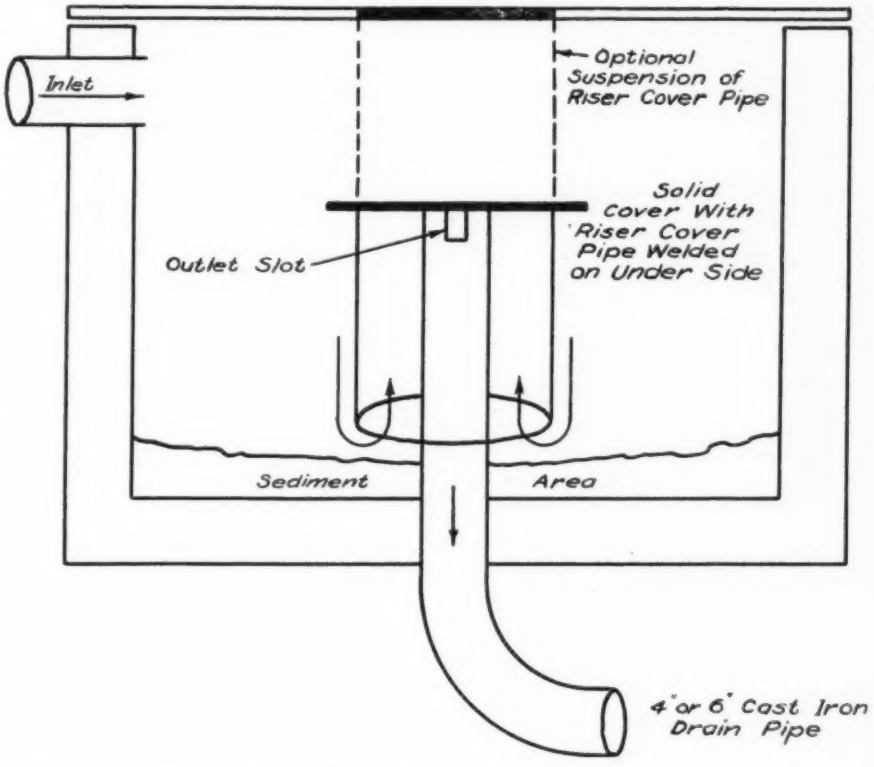
The improved cast iron was developed after many years of experiment and testing in the Bayonne (N. J.) research laboratories of International Nickel's Development and Research Division, and is covered by U.S. Patents Nos. 2,485,760-61 granted International Nickel Co.

The inventions covered by the patents are believed to be of unparalleled importance and the material's outstanding strength and ductility, plus resistance to shock, is especially significant and useful to many industries. The potential applications are many and varied. The automotive, agricultural implement, machinery, oil, railroad, water supply, and many other industries can apply it in component parts too numerous to detail. Ductile cast iron, because of its excellent engineering properties will without question assume an important role in industry.

The essential feature of the inventions is the introduction into and retention by the molten iron under treatment of small but effective amounts of magnesium—.04 to 0.1% in the form of a copper or nickel alloy containing 10 to 30% magnesium. The presence of critical amounts of magnesium in the novel cast iron produces a new graphite structure which is in the form of spheroids or compacted particles. Due to the elimination of a substantial amount of the usual weakening flake graphite, the new magnesium-treated nodular-graphite cast iron possesses excellent engineering properties, particularly high tensile strength, elastic modulus, yield strength, toughness and ductility. Under stress, it behaves elastically like steel rather than like cast iron.

More than forty companies in many industries are already licensed under the patents to produce this new shock resistant, ductile cast iron.

SAND AND GREASE TRAP FOR CAR WASH RACK*


Inlet
Optional Suspension of Riser Cover Pipe
Solid Cover With Riser Cover Pipe Welded on Under Side
Outlet Slot
Sediment
Area
4" or 6" Cast Iron Drain Pipe

The accompanying sketch shows the construction of a sand and grease trap for automobile wash racks. Experience over the past 15 years has never shown any indication that sand or grease gets past this trap. Whenever sand fills the trap to the lip of the cover pipe of the riser the flow will stop running through the trap and it will have to be cleaned out.

The inlet to the trap can be as sketched or it can be an iron grill covering the entire trap. The outlet slot is, of course, in the riser pipe and not the riser cover pipe.

(*Contributed by Harry H. Clayton, Supt., Lewisville, Ark.)

PENNA. SEWAGE AND INDUSTRIAL WASTES ASSN. MEETING

IN the 23rd year of the Penna. Sewage and Industrial Wastes Assn. it held its 21st annual conference at Penna. State College at State College, Pa., from August 24 to 26. This conference immediately followed the annual meeting of the Penna. Water Works Operators' Assn., (reported in the November issue of *Water & Sewage Works*). Registration for the meeting totaled 238 persons.

New Officers

At the annual business meeting **E. T. Roetman** was elected President of the association. Mr. Roetman, however, had recently left Pennsylvania to become Assistant Basin Engineer for the U. S. Public Health Service in the Southwest area in Dallas, Texas. Mr. Roetman had been First Vice President of the association when he held the position of Sanitary Engineer with the American Viscose Co. at Philadelphia, Pa. Mr. Roetman wired his thanks and his resignation from the position, whereupon the Penna. Assoc. elected the following officers:

President
John T. Campbell, Pres.
Chester Engineers
Pittsburgh, Pa.

First Vice President
Howard T. Reuning, Engr.
Keystone Tanning & Glue Co.
Ridgeway, Pa.

Second Vice President
Robert M. Bolenius, Chemist
Township of Abington
Montgomery County, Pa.

Secretary-Treasurer
Bernard S. Bush, Dist. Engr.
Penna. Dept. of Health
Wilkes-Barre, Pa.

J. R. Hoffert, Chief Engr. of the Penna. State Dept. of Health, was re-elected Editor of the association's publication, and Francis S. Friel, Cons. Engineer, Philadelphia, was re-elected chairman of the program committee.

Operators' Qualifications

Under new business, the committee on Operators' Qualifications under the chairmanship of **L. D. Matter,** Assistant Chief Engr. of the Penna. State Dept. of Health, Harrisburg, made a report with recommendations. These recommendations authorize the Executive Committee to absolve the Qualifications Committee and to appoint a Certification Board of three members, one to be selected from the Penna. State Dept. of Health, one from Penna. State College, and one from the Penna. Sewage and Industrial Wastes Assn.

Schuylkill River Clean-Up

The conference opened with an evening session on Wednesday, August 24. The topic for this session was **The Schuylkill River Clean-Up,** with presentations by J. Raymund Hoffert, Chief Engineer, Penna. State Dept. of Health, Harrisburg, and E. S. McCawley, Deputy Secretary, Penna. Dept. of Forests and Waters, Harrisburg. Both talks were illustrated.

J. R. Hoffert pointed out that in 1926 there were 900 million tons of coal waste in the streams of Pennsylvania. Between 1936 and 1948 12 million tons of coal waste were recovered from the streams alone. There are two parts to the problem of colliery pollution of streams, first to stop the influx of silt, and, second, to remove silt deposits. Mr. Hoffert gave the history of the attack on the program and paid tribute to the cooperation of the collieries. In all, 23 collieries were studied with one full day being devoted to each, in each of four coal fields in the State. As a result of this work and meetings with representatives of the collieries rules were set up for desilting the waste from these plants. All wet process collieries in the Schuylkill Basin now have treatment processes. The problem involved in removing coal silt from coal waste is aggravated by the particle size. These powdered particles are generally the size of talcum powder particles and are extremely difficult to remove by settling.

In discussing the paper, **E. S. McCawley** stated that the attempt to rid the Schuylkill River of its load of silt had been brought about by a joint venture contract in which there was cooperative planning on several levels. Work is being done by cooperation of the State of Penna. and the Army Engineers. Part of the work involves the construction of dams and the providing of land on which to discharge the silt from the river.

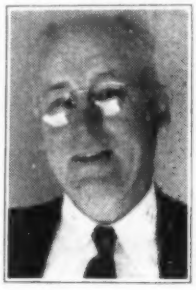
In order to bring about a proper approach to the subject it was necessary to study the particle size of the coal culm and the rate of settling. On this basis, impounding reservoirs were constructed to hold the dredged silt until processing could take place. Dredging is being done by electric dredges. There are 36 major contracts of which 18 are now complete and four almost complete. The state share for this program is 35 million dollars.

1949-50 Officers

Presidents			Vice Presidents		Secretary-Treasurer
Outgoing	Resigned	Incoming	First	Second	
Chas. H. Young	*E. T. Roetman*	*John Campbell*	*H. T. Reuning*	*Robt. T. Bolenius*	*B. S. Bush*
Div. Engr.	*Asst. Bas. Engr.*	*Pres.*	*Engr.*	*Chemist*	*Dist. Engr.*
Pa. H'lth Dept.	*U.S.P.H.S.*	*Chester Engrs.*	*Keystone Tanning Co.*	*T'nship Abington*	*Pa. H'lth Dept.*
Harrisburg	*Dallas, Tex.*	*Pittsburgh, Pa.*	*Ridgeway, Pa.*	*Montgomery Co., Pa.*	*Wilkes-Barre, Pa.*
(New Dir. F.S.W.A.)					

Philadelphia Sewage Treatment

"General Plan and Progress" by Samuel S. Baxter, Asst. Chief Engineer, Bureau of Engineering, Surveys and Zoning, Harrisburg, Pa.



Philadelphia's Program

S. S. Baxter
Asst. Ch. Engr.
Bur. of Engr.
Philadelphia

E. R. Schofield
Prin. Asst. Engr.
Bur. of Engr.
Philadelphia

Mr. Baxter reviewed the problem of the Philadelphia sewage treatment program, stating that there are now three plants for the city. The first, the Northeast plant of 60 mgd. capacity, was built in 1923 and is extremely overloaded.

In 1940 sewer rental was instituted, and in 1945 a program to construct and operate the new plants was undertaken. The first step in the program was to enlarge the Northeast plant to 125 mgd. capacity. The old Imhoff tanks are being abandoned. At the same time a new Southeast works of 140 mgd. capacity is being constructed. This will consist of primary treatment only with separate sludge digestion and chlorination.

It was noted that the estimated cost of the program in 1943 was 39 million dollars. Now the estimated cost is 60 million dollars, and by the end of 1949 31 million will have been expended upon the construction of the sewage treatment plant program.

"Design Factors" by Edwin R. Schofield, Principal Assistant Engr. of Design, Bureau of Engineering, Surveys and Zoning, Harrisburg, Pa. Mr. Schofield stated that the Northeast plant would serve 82,000 acres, where the design basis was 142 gpcd., or a population of 846,000 in 1970, (10.6 persons per acre). The maximum capacity of the plant is 200 mgd. The average flow expected next year is 91 mgd. of a sewage containing 200 ppm. of suspended solids and 200 ppm. of B.O.D.

The process at the Northeast plant will consist of modified aeration or high rate activated sludge, where 0.4 cubic feet per gal. of air will be used. At 125 mgd. flow it is expected that the B.O.D. reduction will be 30 per cent in the primary tanks and 45 per cent in the aeration tanks. The sedimentation tank overflow rate is 1,000 gal. per sq. ft. per 24 hr.

Of particular interest in this plant is the use of direct heating by the Selas method for heating sludge. This process was described by Schofield and Tark in *Water & Sewage Works* on p. 172 of the May 1948 issue.

"Effects of Industrial Wastes on the Program" by Harry M. Beaumont, Chief, Industrial Wastes Div., Bureau of Engineering, Surveys and Zoning.

Mr. Beaumont's paper was read by **E. P. Morris,** Asst. Engr. of the Dept. The paper pointed out that there is a great variety of industrial wastes in Philadelphia, where 258 plants with water borne wastes exist. Rules and regulations have been set up for these plants and include such items as: no grease, no flammable material, no fibrous material, no high temperature waste, no alkaline or acid waste, no toxic waste, and no waste which caused deposition in sewers.

Mr. Beaumont's paper continued with a discussion of wastes from various types of industries and what is expected of the various industries in the way of pre-treatment or mixing of waste.

SEWAGE WORKS FORUM

For one session the meeting was divided into two parts, one a Sewage Works Forum, and the other an Industrial Wastes Forum. The Sewage Works Forum was conducted under the leadership of **Charles H. Young,** Div. Engr. of the Penna. Dept. of Health, Harrisburg, Pa.

Operation at Butler, Pa.

"Operation Practices and Experiences at Butler" by B. S. Johns, Supt., Butler Sewage Treatment Works, Butler, Pa.

Mr. Johns described the sewage plant, which was first simply a primary treatment plant, later a chemical treatment plant, and since 1939 a trickling filter plant. Population tributary is 30,000 and the flow is 2 mgd. The plant which has heretofore had a gas engine generator is now installing a gas engine direct-connected to a sewage pump. One of the problems at the Butler plant has been the deposition of grit in the mercury well of the trickling filter rotating distributor. At this plant the effluent is screened and used for operating the chlorinators.

Industrial Wastes

R. F. Weston
San. Engr.
Atlantic Refinery
Philadelphia

G. A. Rohlich
Prof. San. Engr.
Univ. of Wis.
Madison, Wis.

Open Sessions

H. P. Hammond
Dean of Engr.
Penn State Coll.
State College, Pa.

J. R. Hoffert
Ch. Engr.
Pa. H'lth Dept.
Harrisburg, Pa.

This paper was discussed by **T. R. Haseltine,** Consulting Engr. of the Chester Engineers, Pittsburgh, and a former operator of the Butler plant. Mr. Haseltine pointed out that the annual savings from the use of gas in 1942 had amounted to $1880. In 1946-7 the savings were $1500. The gas engine had paid for itself in seven years.

Abington Township Plant

"Starting the Abington Township Sewage Treatment Plant" by Robert M. Bolenius, Abington, Montgomery County, Pa.

Before 1941 this residential township had nothing but septic tanks. The study of the township indicated that the flow was 75 gpcd. from 20,000 persons plus infiltration. The plant was therefore designed for approximately 2 mgd. with a maximum flow of 3.4 mgd.

Mr. Bolenius described the treatment works as consisting of sedimentation tanks and secondary treatment by aeration, using swing diffusers with a 6-hour detention period and 25 per cent return sludge. Sludge digestion capacity is provided to the extent of 4.3 cu. ft. per cap. A PFT heat exchanger is provided for heating the sludge and two-stage digestion is possible. The plant cost $700,000.

Mr. Bolenius also told of some of the unique problems involved in hooking up sewers before the plant was completed and the actual starting of the plant in an area heretofore served by septic tanks. Full operation was not reached until November, 1948,

although the plant was started in early May of that year. In the beginning the sludge was stored until the heated digester was available, and the odors were kept down by sprinkling hypochlorite on the sludge in the open digester.

Plant Operation

B. S. Johns
Supt.
Sewage Works
Butler, Pa.

F. W. Jones
Partner
Havens & Emerson
Cleveland, Ohio

Safety Measures

"SEWAGE PLANT SAFETY MEASURES" by Robert E. Stiemke, Prof. of San. Engineering at Penna. State College, State College, Pa.

Prof. Stiemke pointed to the Federation Manual of Practice on Safety and Hazards in Sewage Treatment plants, and reviewed the causes of accidents. Among the most important sources of accidents are falls, handling materials, body infections (which account for 50 per cent of the insurance claims), noxious gases and vapors, and oxygen deficiency.

Mr. Stiemke said that not only should a plant be designed for safety but there should be safety equipment and that the men should be educated in safety measures and protection against hazards. A study of accidents has indicated that workers violate safe practice approximately 300 times before an accident occurs. Eighty per cent of all accidents have been human failures. According to accident rates the death rate from sewage plant accidents is 200 times as high as those in a machine shop.

Prof. Stiemke listed a number of items which should be considered to prevent accidents in the operation of sewage plants. These include: safety equipment, adequate ventilation, proper plant layout, proper illumination, personal protection, avoiding improper lifting, fire protection, safety signs, good housekeeping and sanitation, and industrial medical service. In general, the small plants are more dangerous than the large because of inadequate safety equipment, or inadequate attention of operators to safety details.

Advice to Operators

"ASPIRIN FOR OPERATORS' HEADACHES" by Frank Woodbury Jones, Partner, Havens and Emerson, Leader Building, Cleveland, Ohio.

By means of analogy to the human body, Mr. Jones pointed out the causes of headaches in sewage treatment plants including storm loads, broken pipes, over-loading, toxic waste, indigestion, stoppages, uncleanliness, over-worked equipment, and neglect of general upkeep and maintenance. Inasmuch as when the head aches the whole body is out of tune, Mr. Jones suggested that there should be "Aspirin" for these headaches. He suggested trying the simple way first to overcome such things as foaming, bulking, odors, etc. Mr. Jones also suggested that one operator should learn from the experience of others and should seek the help of health departments and read periodicals and magazines which in this field give advice on how to cure operators' headaches.

In closing he pointed out that small matters often add up to a large headache and that attention should be given to watching for the small problems and meeting them as they arrive.

High Capacity Filters

"HIGH CAPACITY FILTER RATES AND LOADINGS" by Ralph E. Fuhrman, Supt., District of Columbia Sewage Treatment Plant, Blue Plains, Washington, D.C.

Discussion by **Wayne A. Kivell,** Sales Engr., The Dorr Co., New York, N.Y. and **Fred A. Eidsness,** Sales Engr. Infilco, Inc., Philadelphia, Pa.

Mr. Fuhrman opened his paper with a review of the history of high rate or high capacity filters. Following that he reviewed the National Research Council progress report on high rate filters in military plants. That report appeared in the September, 1947, issue of the *Sewage Works Journal.*

Dinner Speakers

H. E. Moses
Cons. Ch. Engr.
Pa. H'lth Dept.
Harrisburg, Pa.

W. H. Wisely
Exec. Secy.
F.S.W.A.
Champaign, Ill.

Among the advantages of the high capacity filter are a construction cost of just 60 per cent of the standard rate filters and an annual cost of operation 20 per cent less than standard rates and 25 per cent less then activated sludge.

Ind. Waste

H. W. Gehm
Tech. Advisor
National Council
New York City

Safety

R. E. Stiemke
Prof. San. Eng.
Penn. State Coll.
State College, Pa.

In addititon there is an increased contact time between organic matter and the media, an increased supply of micro-organisms and a tendency to distribute the load over 24 hours, which gives improved operation of the primary tanks, reduction in filter flies and other advantages.

Mr. Fuhrman closed with the statement that there should be a standardization of terminology for trickling filter loading.

W. A. Kivell, in discussing the paper, listed the reviews of recent dates and spoke of the many variables involved in high rate filters. He pointed out that attempts are now being made to establish a limit to these variables. He believes that the efficiency is independent of loading over wide ranges, as indicated in a 1931 review of 15 standard rate plants.

Mr. Kivell also stated that the organisms needed a constant food supply and that recirculation smooths out this food supply. He suggested that in considering loading, the formulation be made to include primary tank operation. But he pointed out that it was impossible to reduce sewage treatment to an exact mathematical formula, because there are too many variables. There are now 325 high rate filter plants in operation.

Fred A. Eidsness discussed the paper briefly and emphasized Mr. Fuhrman's point that there is a need for standard terminology in reference to loading. He said that there are two factors to consider, first surface loading or rate per acre per day and secondly the B.O.D. loading in pounds per unit volume. Loading terminology should be standardized to include both factors.

FINANCING SEWERAGE PROJECTS

The problem for Financing Sewerage Projects was presented by three different authors under three different aspects, engineering, financial, and legal.

Engineering

"FINANCING SEWERAGE PROJECTS FROM THE ENGINEER'S VIEWPOINT" by Francis S. Friel, Pres., Albright & Friel, Inc., Philadelphia, Pa.

According to Mr. Friel, the financing of construction of municipal sewage works under present conditions of high cost is of concern to everyone. Prior to the war construction costs were low compared to today's prices. Present construction costs are 267 per cent above the 1933 level and 197 per cent above the 1940 level. Interest rates on municipal bonds are lower today than before the war, and this is somewhat of a redeeming feature, according to Mr. Friel.

Mr. Friel pointed out that the common methods of financing include general obligation bonds, assessments using general obligation bonds and revolving funds, current revenue from existing sources or from reserves, and the creation of an authority for the issuance of revenue bonds, temporary loans, combinations of two or more of the above methods, or through privately owned sewer companies. Mr. Friel devoted his paper to general obligation bonds, revenue bonds issued by an authority, and to various combinations.

Revenue bonds as a method of financing with the establishment of an authority are used effectively where a municipality does not have sufficient borrowing capacity to finance a project with general obligation bonds. Mr. Friel referred to the possibility of combining special assessments with the proceeds of general obligation bonds, a practice which has been employed many times in Pennsylvania. In this case branch sewers are assessed against the abutting property, and the cost of sewage treatment facilities, etc., are financed through general obligation bonds. Mr. Friel said that under present conditions, it is important that the cost of branch sewers be assessed against the abutting property owners. This method of financing results in a much lower yearly sewer rental cost then would be the case by any other system of financing.

After pointing out that the establishment of a sewer rental service does not always adequately distribute the charge for service, and that there are many factors to be considered in financing of sewage works, such as the equitable allocation of cost or of annual revenue, extension to new areas, and water usage, Mr. Friel recommended the following three-part system for financing, either by general obligation or by authority revenue bonds: (1) For the construction of facilities which serve the region as a whole such as outfall sewers, pumping stations, and sewage plants, financed either wholly or in part by taxation, (2) the construction of local branch sewers may be financed through front foot assessments, and (3) operation and maintenance of the entire system and the carrying charges on other capital costs not wholly covered by item (1), may be financed through a sewer rental or service charge based on water use plus character of wastes in the case of an industry. This three-part system affords excellent opportunities for equitable allocation of sewer service charges to persons and property. With this method a lower annual sewer rental is possible. This results in a more attractive enterprise from the viewpoint of both the property owner and the bond purchaser.

Financial Aspects

"FINANCING SEWER PROJECTS IN PENNSYLVANIA" by Leo M. Dolphin, Dolphin & Co., Investment Bankers, Philadelphia, Pa.

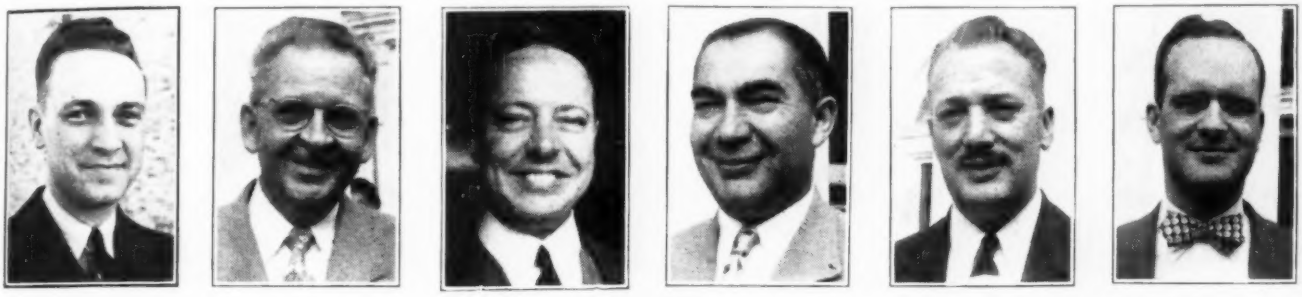
Mr. Dolphin recommended the use of the authority method where revenue bonds are employed. He pointed out that obligations of this character are secured solely by the revenues derived from the project. The first step required is a detailed engineering report of the estimated cost of the project to be constructed, a comprehensive statement of the revenues to be derived therefrom, and a schedule of rates to be charged. In fixing the rate schedule, it is essential to make provision for a minimum margin of safety of 20 per cent.

After the engineering report is complete the second step is the drafting of the indenture by recognized bond attorneys. This indenture should contain provisions for (1) creation of a construction fund, (2) a covenant that the authority will charge and collect rates sufficient in amounts to provide funds for costs of the authority, operating costs, maintenance costs, payment of principal and interest. The indenture should also contain the assignment and pledge to the trustee, the establishment of a debt service reserve fund, the establishment of a maintenance and improvement reserve account, provisions for issuance of additional bonds and for the issuance of periodical financial statements.

Legal Aspects

"SOME LEGAL PROBLEMS CONCERNING THE FINANCING OF SEWAGE PROJECTS" by Joseph Whetstone, Townsend, Elliott & Munson, Attorneys at Law, Philadelphia, Pa.

Mr. Whetstone stated that Pennsylvania statutes provide for general obligation bonds, revolving fund bonds, and non-debt revenue bonds. General obligation bonds are the most common, but for sewage projects this type of financing involves certain undesirable problems. Revolving fund bonds likewise involve borrowing capacity problems and assessment problems. Non-debt revenue bonds are as yet not proven to be constitutional.



Programmers

High Capacity Filters

R. E. Fuhrman
Supt.
D. C. Sewage Works
Blue Plains, D. C.

W. A. Kivell
Engr.
The Dorr Co.
New York City

F. A. Eidsness
Engr.
Infilco, Inc.
Philadelphia

S. I. Zack
Ch. San. Engr.
Gannett, et.al.
Harrisburg, Pa.

Sludge Disposal

P. O. Richter
Mgr., Filt. Div.
Eimco Corp.
Chicago, Ill.

R. D. Nickerson
Engr.
C. E.-Superheater, Inc.
New York City

Mr. Whetstone favors a municipal authority either operating directly or under a so called lease-back method; he explained how the authority can work under both methods.

Solids Disposal

"SLUDGE DISPOSAL" by Samuel I. Zack, Chief San. Engineer, Gannett, Fleming, Corddry & Carpenter, Inc., Harrisburg, Pa.

In a thoroughly detailed paper, Mr. Zack reviewed current practice in the matter of solids disposal. Discussing such items as digestion of sludge, drying on sand filters, lagooning, heat drying of sludge, incineration, and preparation of fertilizer from sludge. The paper was illustrated with pictures of various types of equipment used.

Programmers

Financing
F. S. Friel
Pres.
Albright & Friel
Philadelphia

Sludge Burning
M. A. Clift
Mfrs. Agent
Indianapolis
Ind.

Vacuum Filtration

"VACUUM & CORD FILTRATION" by Paul O. Richter, Manager, Filtration Division, The Eimco Corp., Chicago, Ill.

Mr. Richter pointed out that the trend in sludge dewatering is to vacuum filtration. Regardless of the size of city, vacuum filters can be manfactured for the plant in question.

Mr. Richter explained his company's package unit, where everything is on one platform and the size of the unit can be from 12 to 100 square feet. He commented on the dewatering of four types of sludge, raw, digester, activated, secondary sludge, and chemical treatment sludge. According to Mr. Richter, other chemicals are no better than ferric chloride and lime for dewatering.

For filtering acid waste, special construction is required. Nylon filter cloth has been found to have a marked advantage in the filtration of sludge. An innovation within the last few years is the Wright cord filter, which has been found to be very effective. According to Mr. Richter, equipment for vacuum filtration is adequately developed; what is needed now is improvement in chemical conditioning.

Sludge Incineration

"BURNING SLUDGE" by M. A. Clift, formerly Manager of the San. Engr. Dept., Nichols Engineering & Research Corp., New York, N.Y., now a manufacturers' agent in Indianapolis, Ind.

Mr. Clift described the Nichols-Herreshoff incinerator and showed how it works, and where the drying and burning takes place on the different hearths. He commented that for the drying and incineration of raw sludge more volume was required in the incinerator than for the drying and incineration of digested sludge.

Drying

"DRYING" by Robert D. Nickerson, Engineer, Combustion Engineering-Superheater, Inc., Flash Dryer Div., New York, N.Y.

Mr. Nickerson discussed the drying of sludge in the C. E. Raymond Flash Dryer System, showing diagrams and pictures of the operation of the dryer. He explained how this system could be used either for drying sludge or burning it. When sludge is dried, the need for handling ash is eliminated.

INDUSTRIAL WASTE FORUM

(This session was reported by D. Paul Rogers, Acting Chief Chemist, Pennsylvania Department of Health, Harrisburg, Pa.)

The Industrial Waste Forum was under the leadership of **Roy F. Weston,** San. Engineer, The Atlantic Refining Company, Philadelphia, Pa.

Stream Biology

"POLLUTION EFFECTS ON STREAM BIOLOGY" by Dr. Ruth Patrick, Curator of Limnology, Academy of Natural Sciences, Philadelphia, Pa.

In a biological survey of a stream, it is proposed that the organic carbon be the index of pollution. Biodynamic science shows a difference in degree of pollution from the balancing of animal and plant life for the stream as determined at various stations along the stream. Nitrites, proteins, cellulose, bacteria, and fungus make up the water soluble forms of food for the algae, and the green plants take the carbon dioxide, water, and sunlight and make carbohydrates by means of the process of photosynthesis. Algae play a most important part in the oxygenation of water.

In order to obtain the general characteristics of the stream at the various stations, the following determinations are made: Alkalinity, pH, hardness, calcium, magnesium, sodium, potassium, ammonia nitrogen, nitrite nitrogen, silica, iron, sulfate, phosphate, chloride, free CO_2, turbidity, total conductivity, D.O. and B.O.D.

From the biological study, the organisms are classified into taxonomic groups according to their natural relationships. This classification consists of seven different groups. (1) Pollution algae and rotifers (blue green algae, spirogyra, etc.); (2) tolerant worms etc; (3) protozoa; (4) non-pollution algae—diatoms, etc.; (5) sensitive rotifers, clams, etc; (6) insects and crustacea, and (7) fish. The numbers of species found in each group are compared with the average number of species as found in normal healthy stations.

A *healthy station* is one, therefore, that has 100% value for each of the biological groupings above and sustains a balance of organisms. A *semi-healthy station*, slightly unbalanced, is one with values ranging from 100 to 150% for the first 4 groups and from 50 to 65% for the last 3 groups. A *polluted station* is one whose normal and healthy balance of organisms is definitely upset and has values of 130 to 200% for the first 3 groups and from 15 to 50% for the 4th to 6th group, with zero for the 7th group. A *very polluted station* is one which is definitely toxic to animal life with no species for the 2nd, 5th, 6th and 7th groups and 10 to 30% values for the 1st, 3rd, and 4th groups.

Two Listeners

R. R. Balmer
San. Engr.
DuPont
Wilmington, Del.

Cliff Morelli
Engr.
Infilco, Inc.
New York City

It is necessary to use the multiplicity of groups to determine the pattern of the biological chart for each station. In order to determine the effect a waste discharge can have on a stream, three possible sources of information are presented: (1) Chemical and physical examinations; (2) dilution method on organisms in the laboratory to eliminate toxic effects, and (3) pollutiton effects on stream biology and the rate of recovery in the stream.

This biological yardstick is a new approach to the problem of pollution

and needs to be tested out in other areas and in conjunction with the various yardsticks at hand.

Sedimentation and Flotation

"PRINCIPLES OF GRAVITY, SEDIMENTATION AND FLOTATION," by Dr. Gerard A. Rohlich, Prof. of Sanitary Engineering, Univ. of Wisconsin, Madison, Wis.

Basic criteria are presented so that efficient sedimentation may be judged. Fundamental principles are used in designing a sedimentation basin in oil separators. For oil and water Stokes law is used

$$V = \frac{1}{18} \frac{Pg}{\mu} \qquad (S\text{-}1)D^2$$

in which is the drag coefficient, g the gravitational constant of 980.66 cm. per sec. squared, μ the absolute viscosity of water, S the specific gravity, and D the diameter of the particle.

Dead areas, adequate length, eddy currents, and the dispersion index of the tank are factors which enter into the concept of design along with the detention period of the tank to produce the most efficient shape of the tank. It is possible (1) to determine the behavior of the tank, (2) to theorize what a perfect sedimentation tank would be, and (3) to increase the depth of the tank to get the desired results by use of horizontal or vertical baffles.

Following the paper, the speaker presented a motion picture of the laboratory experiments on the effects of design of the tank on mixtures of wax spheres in water, insofar as eddies, currents, use of baffles, and length of tank are concerned.

Waste Acid Treatment

"LIME IN WASTE ACID TREATMENT" by C. J. Lewis, Technical Director, Warner Co., Devault, Pa.

Since a liming material is usually the most economic alkaline agent used in treatment of acid wastes, a preliminary study is necessary to determine the best choice of this type of material for such treatment.

While the contact time is limited, the basicity factor in grams equivalent and the reaction rate in pH are factors to be considered.

Hydrated lime feeding difficulties have been overcome, and this method now presents a very economic treatment process. Quick lime use still has its problems, one of which is the presence of tramp iron, such as bolts, nuts, etc. to jam the screw conveyor. Proper slacking is another problem in preparing a water slurry. Dolomitic quicklimes usually require more time in hydration. Setting action or gelling occurs when insufficient water is used for the slurry.

In sulfuric acid systems of neutralization, calcium sulfate is quite insoluble as contrasted with magnesium sulfate. Dolomitic liming lessens sludge formation and in some cases eliminates it entirely. Also, scale formation is not only prevented but scale previously formed is dissolved away.

The addition of dry lime is being studied at Marblehead's industrial waste pilot plant located at Chicago. Some of the results are entirely different from anything previously obtained, particularly on waste pickle liquor. Mr. Lewis hopes to encourage more research on application of liming materials to acid wastes.

Anaerobic Waste Treatment

"HIGH RATE ANAEROBIC WASTE TREATMENT," by Dr. Harry W. Gehm and Vaughn Behn, Technical Advisor and Development Engineer, respectively, National Council for Stream Improvement of the Pulp, Paper, and Paperboard Industries, New York, N.Y.

The high rate anaerobic digestion implies a waste treatment process in which liquid wastes are digested by anaerobic bacteria. It is quite applicable to wastes containing high dissolved organic matter such as distillery wastes, beet sugar milk, yeast, starch, antibiotic wastes, etc. Studies are being made on strawboard wastes, chipboard, sulfite waste liquor at various universities for the National Stream Improvement program. In short periods of digestion the B.O.D. is reduced to a high degree. The B.O.D. is the basic determinant ruling out the volatile matter for this type of treatment. However, to compare, to evaluate, and to control this treatment analytical tests consist of the following: Total solids, volatile solids, suspended solids, volatile suspended solids, pH, alkalinity, acidity, sulfates, nitrogen, phosphorus, B.O.D. (5-day), sugars, solvents, and toxic substances. Loading rates fell between 0.10 pound and 0.04 pound B.O.D. Stable digestion falls between pH 7.0 and 7.5. It is hoped that further progress may be developed in the laboratory to more fully understand the mechanism of the process for a very important industrial waste treatment.

N.Y. State Legislative Committee Recommends Sewer Authority Law

Also proposes study of State Loan Authority

The 1949 Report of the Special Committee on Pollution Abatement of the Joint Legislative Committee on Interstate Cooperation has been released as Legislative Document (1949) No. 51. The report was prepared March 24, 1949, and recommended the passage of the bill establishing the N.Y. State Water Pollution Control Board. This act was passed and signed by Governor Dewey on April 20. The report also recommended that the State of New York participate in the New England Water Pollution Control Compact, which act was also passed and signed by the governor.

In the report the Special Committee also recommended further two ways and means of expediting financing and construction of sewer systems and sewage treatment works in muncipalities where constitutional debt limits are a preclusive factor.

These two proposals are: (1) The establishment by constitutional amendment, of a general sewer authority law which would permit communities to establish authorities and float bonds for self liquidating projects, and (2) establishment of a "Stage Sewage Works Authority" to manage a fund which municipalities could borrow to build needed pollution control facilities.

The general sewer authority law would eliminate the slow and cumbersome present method of procedure whereby a state legislative act is required to set up each individual sewer authority. The establishment of a state loan authority is something new in state procedure and was recommended for further study.

Operating Cost Guide For Power Crane And Shovel

Power Crane and Shovel Assn. has just released a bulletin: the Operating Cost Guide. The bulletin is published as a method of estimating cost of ownership and operation of power shovels, drag lines, clam shells and cranes.

Copies of the bulletin known as "Technical Bulletin No. 2" may be obtained for Fifty (50) cents each by writing to the Power Crane and Shovel Assn., 74 Trinity Place, New York 6, N.Y. Complimentary copies will be furnished to Engineering Schools and Colleges upon request. Address your request to Herbert F. Blake, Jr., Secretary.

Comments of the Editors

As It Should Be— A Plea Answered

In this issue we feature the report covering the record breaking 1949 Convention of the Federation of Sewage Works Associations held in Boston October 16-20. This convention was outstanding in many respects and the ladies will agree that one direction in which it was outstanding was the entertainment planned for their pleasure, notably the trips to Boston's many landmarks and points of historic interest, and an all-day tour out through the countryside to famed Lexington and Concord.

Many things could be said about the Boston convention, such as the record attendance, the excellent program, the pleasing manufacturer's exhibits, and the appealing entertainment which featured "home talent" as represented by the singing of the St. Louis Russell's, and the New England all-member quartet, headed by Boston's Karl Kennison—No. 1 host. Also, of the richly deserved recognition of "Bill" Orchard, who received the Emerson Medal for his untiring long-time guidance of the Federation in financial matters, in convention management, and in other directions.

Among the most significant actions taken by the Federation's Board of Control was the vote to change the name of the *Sewage Works Journal* to *Sewage & Industrial Wastes*—"The Journal of the Federation of Sewage Works Ass'ns." This change in the name of the Journal signifies the importance which the Federation is attaching to the amelioration of stream pollution by industry and the effective treatment of those wastes which cannot otherwise be reduced or eliminated through process changes within the plant at a lesser overall cost. The change in the Journal name also signifies the extent to which industrial waste men have been affiliating with the Federation, and the extent to which papers on industrial wastes treatment have been presented before the Federation and its member associations, and published in the Journal during the past two years. The change in name takes effect with the first issue of the Journal in 1950 when the Journal goes on a monthly publication schedule, necessitating a $23,000 increase in the Federation budget, and upping the cost of the Journal to $5.00 to members for the twelve issues against $3.00 for six issues heretofore.

Also, recognizing the fact that a number of member associations have changed their names so as to incorporate "Industrial Wastes" in the name, and others about to do likewise because of the influx of new members representing industry, the Board voted to change the name of the Federation so as to incorporate "Industrial Wastes" therein. Several proposed names were tossed around but none appealed as being completely satisfactory. The most favored name considered was "The Federation of Sewage and Industrial Wastes Ass'ns," and this was dropped into the lap of the Constitutional Committee, with instructions to prepare a constitutional amendment which will incorporate the new name, or some better name which will denote the inclusion of industrial waste interests on an equal footing with municipal sewage disposal interests.

The Board's decision to incorporate "Industrial Wastes" in the name of the Federation was perhaps hurried along by the observation that during the past two years membership growth has been in increasing measure due to new memberships taken out by industrial waste men; and that record meetings' attendance has been due to increasing participation by industrial waste men. Testimony toward this trend was had during the Boston convention when it was observed that the "Industrial Wastes Forum" drew an attendance almost two to one greater than the "Sewage Treatment Forum" held simultaneously in an adjoining room. To this writer's thinking such was regrettable, since there were problems discussed in the Industrial Waste Session which are of major import to sewage works operators and managers. We refer to the important consideration of joint treatment of industrial and domestic sewages and the extent to which the municipality and industry can and should cooperate in so doing, either by operating a separate municipal plant for treating industrial sewages or by introduction of partially treated industrial wastes into the public sewer system, and payment by industry to the municipality or sanitary district of additional costs incident to this cooperative method of community wastes disposal.

Of further interest to Federation members and industrialists, upon recommendation of the Industrial Waste Committee (F. W. Mohlman, Chairman) the Board voted to establish an award, to be known as the "Industrial Waste Award," which will be made annually to that member contributing the most valuable paper during the year dealing with the treatment of or conversion of industrial wastes into useful products. This award is to be made along with other Federation awards, but will be limited to those members actually in the employ of industry or trade association, the intent being to stimulate and recognize effort put forth by industrial establishments, as well as the work of the member employed to make the studies productive of advancement of the art and science of industrial waste treatment or the curtailment of pollution through other means.

Those of our readers who may remember an editorial by this writer in *Water & Sewage Works* for Nov., 1946, captioned "On Making a Place for the Industrial Waste Treatment Man," will appreciate the gratification felt with the developments which have taken place in the Sewage Works Federation since the writing of the 1946 editorial pleading that, because of common interests, the Federation promptly make a place for the Industrial Waste man, and thereby preclude the practical certainty that a new organization would be established to meet the needs of the industrial waste fraternity. At the time the principal argument presented against the proposal was that, "The tail might before long be wagging the dog." We are pleased to see that such fears have now been relegated to the ash-can, but we again say that if this should ever prove to be the case, then the "dog" deserves to be "wagged." We do not believe that such will ever be the case, regardless of the recent interest and the noted comparison of attendance at the two parallel forums at the Boston convention. There is too much of common interest between the sewage works operator and the industrial wastes chemist or engineer to ever result in more than temporary domination of either interest.

L. H. Enslow

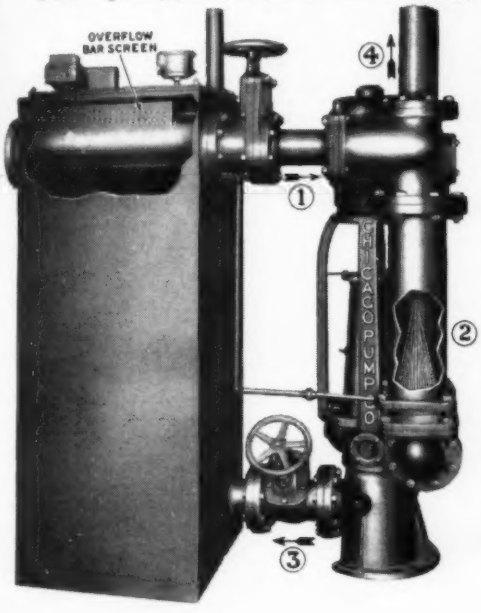
"CHICAGO" PUMPS

FOR SEWAGE AND SLUDGE

FLUSH KLEEN EJECTORS FOR SEWAGE

"Flush Kleen" pumps provide automatic, trouble-free service in sewage lift-stations. They require no manual attention except periodic lubrication and inspection. No. labor is required for disassembling and cleaning clogged pumps as with other types.

The impellers handle only strained sewage. No solids pass through the impeller to cause excessive strain and wear on impeller, shaft, bearings or motor; pumps remain in balance and operate economically with little attention.

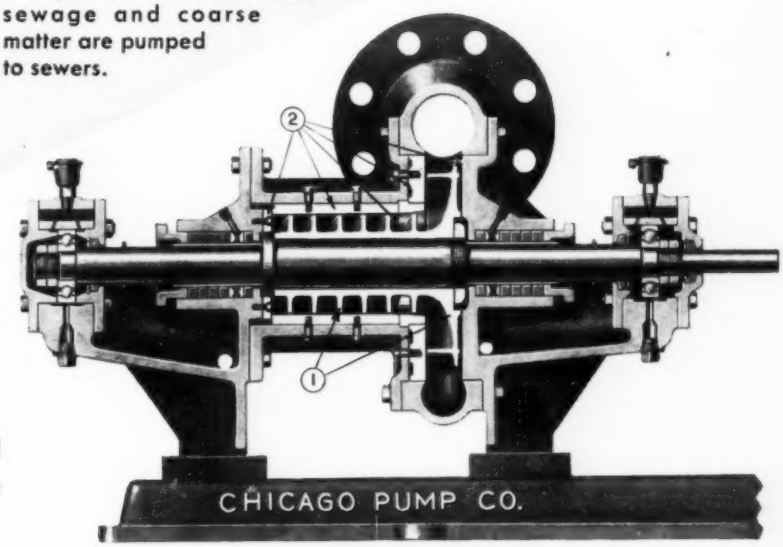


Filling Wet Well

1. Sewage flows through inlet pipe.
2. Coarse matter is retained on strainer.
3. Strained sewage flows through idle pump to wet well.

Pumping

3. Strained sewage is pumped from wet well.
2. Coarse matter is backwashed from strainer.
4. Special check valve closes; sewage and coarse matter are pumped to sewers.



SCRU-PELLER PUMPS FOR SLUDGE

The Scru-Peller Pump was specifically designed to handle sludge. Coarse, stringy material is cut and cannot wrap or bind the impellers.

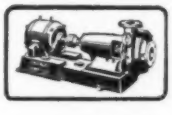
1 SCREW and IMPELLER are keyed on the shaft and held firmly against a shoulder on the shaft by a nut. The screw has two flights; and the impeller has two blades. Each flight in the conveyor connects directly with its own blade of the impeller.

2 CUTTING EDGES. There are four cutting bars and a cutting ring in the screw housing and four cutting bars in the pump casing. The cutting takes place between the edges of the screw and the cutting edges in the screw housing, between the edges of the impeller blades and the cutting edges in front of the impeller, and between the edges of the impeller blades on the back of the impeller and the cutting edges of the pump casing.

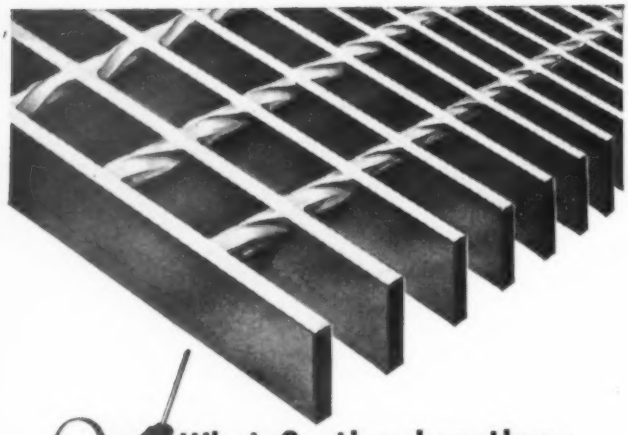
CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2300 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**



Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers, Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.



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1. One-piece electroforged construction develops the full strength of all sections.
2. Maximum Open Area for light and ventilation.
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4. Self-Cleaning, no sharp angles to retain debris.
5. Safe footing at all times due to twisted cross bar.

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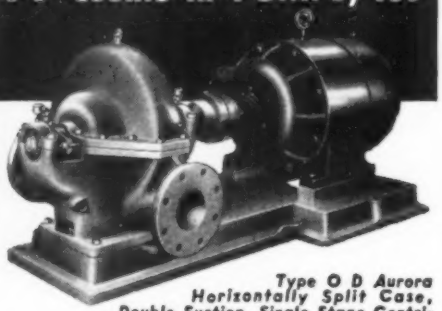
for general water supply, for municipalities, industrial establishments.

also for handling condenser circulating water, wash water, liquids in paper mills and distilleries, chemical solutions, oils in oil fields and refineries, irrigation, etc.



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For high pressure, Small capacity requirements (up to 150 G.P.M.). Wide operating range characteristics. No metal to metal contacts. Handles non-lubricating liquids without wear. Only one moving part—the Impeller.

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MEETINGS SCHEDULED

NOV. 29-DEC. 1—STILLWATER, OKLA. (Oklahoma A. & M. College)
Oklahoma Water and Sewage Conference. Sec'y, H. J. Darcey, State Dept. of Health, Oklahoma City 5, Okla.

DEC. 1-3—CUBA (Place not decided)
Cuban Section A.W.W.A. Sec'y, Laurence H. Daniels, Baratillog 9, Havana, Cuba.

DEC. 5-7—ALBANY, GA. (Gordon Hotel)
Southeastern Section A.W.W.A. Sec'y, T. A. Kolb, Room 433 Wade Hampton Office Bldg., Columbia, S.C.

DEC. 14—AUGUSTA, ME.
Maine Water Utilities Assn. Sec'y, Earle A. Tarr, Winthrop, Me.

DEC. 15—BOSTON, MASS. (Statler Hotel)
New England Water Works Association. Sec'y, Joseph C. Knox, 204 Tremont Building, Boston 8, Mass.

JAN. 17, 1950—NEW YORK, N.Y. (Statler Hotel)
New York Section A.W.W.A. (Winter Luncheon Meeting). Sec'y, Rollo K. Blanchard, 50 West 50th St., New York 20, N.Y.

JAN. 17-19—NEW YORK, N.Y. (Commodore Hotel)
American Society of Civil Engineers. Sec'y, Wm. N. Carey, 33 West 39th St., New York, N.Y.
(Sanitary Engineering Division, Thursday, Jan. 19 A.M. and P.M.)

JAN. 20-21—NEW YORK, N.Y. (Statler Hotel)
New York State Sewage Works Association. Sec'y, R. C. Sweeney, District Engineer, State Dept. of Health, 119 E. Main St., Rochester, N.Y.

FEB. 8—PORTLAND, ME.
Maine Water Utilities Association. Sec'y, Earle A. Tarr, Supt., Winthrop, Me.

MAR. 22-24—TRENTON, N.J. (Stacy-Trent Hotel)
New Jersey Sewage Works Association. Sec'y, Michael S. Kachorsky, P. O. Box 283, Manville, N. J.

APR. 17-19—LITTLE ROCK, ARK. (Robinson Memorial Auditorium)
Arkansas Water & Sewage Conference. Sec'y, Prof. Harrison Hale, 118 Chemistry Bldg., Fayetteville, Ark.

APR. 20-21—SALINA, KANSAS
Kansas Sewage Works Association. Sec'y, James B. Arbuthnot, State Board of Health, University of Kansas, Lawrence, Kansas.

MAY 21-26—PHILADELPHIA, PA. (Reservation announcement Dec. 1)
American Water Works Association (Annual Convention). Executive-Secretary, Harry E. Jordan, 500 Fifth Ave., New York 18, N.Y.

MAY 22-24—TRAVERSE CITY, MICH. (Park Place Hotel)
Michigan Sewage Works Association. Sec'y, D. M. Pierce, State Dept. of Health, Room 334, Administration Bldg., Kansas City 4, Mich.

G-A Electric and Manual Water Service Valve may be operated either by a solenoid on AC or DC circuit or by the handwheel.

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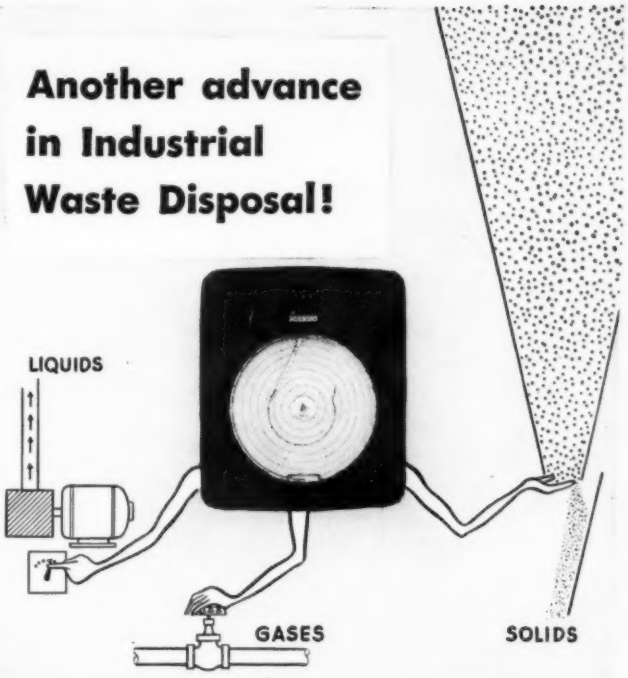

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Feeding of treating chemicals at rates proportionate to flow can *now be done automatically* — with total elimination of time-consuming, periodic adjustment of feeders and pumps. In addition, the proportioning of chemicals is far more accurate, which means a more uniform, satisfactory effluent and a definite saving in cost of chemicals.

The instrument control system is properly engineered for individual plant conditions. Its design depends upon the quantity, corrosive quality, and viscosity of the activated silica, carbon dioxide, soda ash, lime, or other chemicals employed . . . also upon the amount of chemicals to be stored and the type of plant operation.

Virtually *any* set of conditions can be met with one or another of the following instrument control methods offered by Foxboro:

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2. *control of motor operation on dry feeders or on proportioning pumps by "pulse-time" control*
3. *motor speed control on dry feeders or proportioning pumps through electronic control of power input.*

One of these methods may bring substantial new economies to the operation of your waste disposal system. For engineering briefs on industrial waste surveys, chemical control systems, and disposal methods, write **The Foxboro Company, 228 Neponset Ave., Foxboro, Mass., U. S. A.**

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MEASURE AIR OR GAS WITH *cash-register accuracy*

(Above) Typical small-size R-C Meter with inclined differential gauge, with top inlet, and outlet in bedplate.

(Right) Example of large-size, low-pressure R-C Meter, side inlet box and bottom outlet, with a P.V.T.T. Recorder.

Built-in characteristics of R-C Positive Displacement Meters insure unfailing, long-time accuracy:

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2. Accuracy does not depend on uncontrollable factors.
3. Accuracy is not subject to adjustment of meter or recorder by operators.
4. Accuracy is not affected by reasonable overloads.
5. Accuracy is permanent because measuring chambers are surrounded by precision-machined cast iron surfaces.

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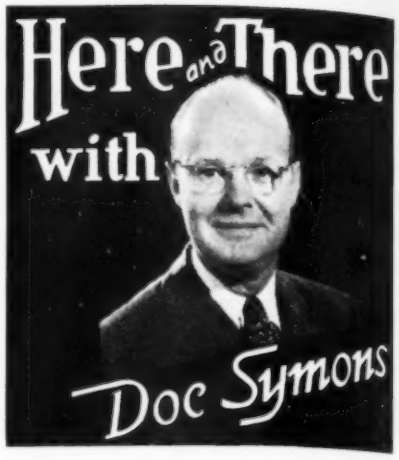


Here's **T**hat **M**an **A**gain—And as the end of 1949 looms ahead, it seems as though we should look back and reminisce a bit. Inasmuch as I'm writing this on the first day of November, I shall make no attempt to review the whole year (how could I?), but let's begin with today and work back as far as space will allow, picking up some stories and mail I haven't touched upon before.

* * *

Just last Friday, that would have been Oct. 28, I journeyed over to Paterson, N.J., at the request of Harry N. Lendall (retired Prof. of Civ. Engr. at Rutgers Univ.) to open the eighth season of the North Jersey Water Superintendents' Conference. There's a great group of individuals. Quite serious, too, and intent on increasing their knowledge of the water works business. Even so, they gave my "Here and There" routine a gratifying reception.—Maybe some day I can do my "Water Isn't H_2O" speech for them.—It's not supposed to be funny.

Wish I had space to name everyone who was there, but I'll have to content myself with saying I was glad to see Chas. H. Capen up and about again—with a cane. "Charlie," who heads the No. Jersey Water Supply Comm. and is Program Chairman of the A.W.W.A., broke an ankle last summer and reported the ordeal in verse, the last stanza of which went as follows:

> So folks, if you would have some fun,
> All tipsy ladders you should shun;
> Unless, you, too, expect a rest
> Enforced without your own request.

* * *

At one of the sessions of the A.P.H.A. meeting in N.Y. City in October, four speakers devoted their papers to the statistical evaluation of data. From where I sat in the audience, I had the distinct feeling that I wasn't the only one who didn't

know "wot-in-hell" they were talking about.—That's why I'm glad that Clarence J. Velz, now Prof. of Statistics at the Univ. of Mich. School of Public Health is going to write a series of articles in **W. & S. W.** on statistics as a tool for the water and sewage works operator.—If anyone can put it in language you and I can understand, Clarence is the "feller."

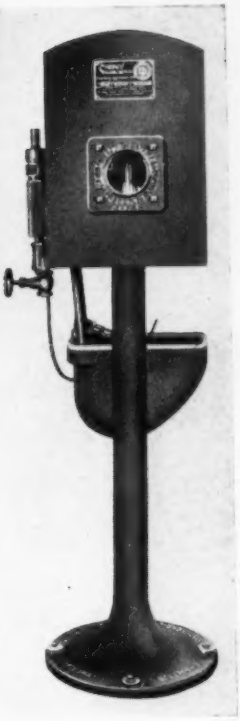
* * *

Mid-October saw the Federation meeting in Boston, and if you'll read the story of that meeting up front in this magazine, you'll find out what a whopping big meeting it was. You'll see there, too, pictures of some of the attendees and participants, but here are some pictures you won't see there. The first one shows Mrs. Tom

Berrigan of Boston and a group of the ladies waiting for the bus outside the Statler Hotel. Mrs. Berrigan (whose husband not only heads the Metro. Dist. Comm. Div. of Sewers, but is on the Water Pollution Advisory Board of Pub. Law 845) was Chairman of the Ladies' Entertainment Committee. In the following foursome you will find "Nat" (Mrs.

Fred W.) Crane, Mrs. C. W. Gordon, "Kay" (Mrs. John W.) Johnson, and my girl "Gin." Of course you know who "my girl Gin" is but to further identify the others, Fred Crane is Gen. Mgr. of the Buffalo Sewer Authority, C. W. Gordon is Chief Engr. of the Drying and Incineration Div. of Combustion Engineering in Chicago, and John W. Johnson is Supt. of Sew. Treat., Buffalo Sewer Auth., Buffalo, N.Y. If you look closely you'll recognize Mrs. Johnson as "Kay" whose photograph was featured in this column a few years back.

Chemco
CHLORINATORS



Chemco Chlorinators are the result of nearly 25 years experience in water treatment and are used in 42 of the 48 states and foreign countries.. They have outstanding design features as shown below...

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CAPACITY RANGES
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CAPACITY RANGES
0-10, 0-15, 0-25
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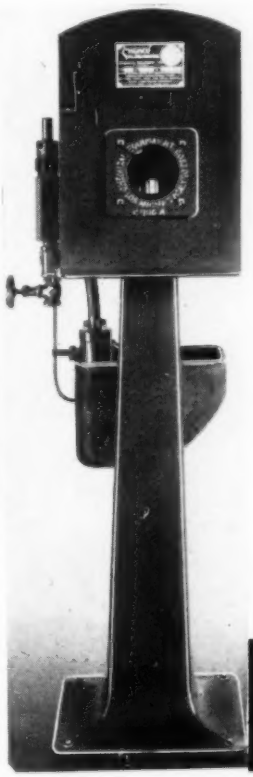

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2 CHEMCO Chlorinators are all based on vacuum design

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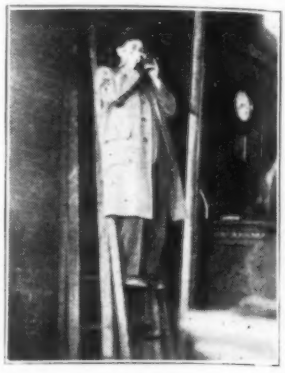
I think that J. J. (Joe) Gilbert of Link-Belt in Philadelphia will recognize this girl taking the bus tours. Name of Louise, I think.

And "Bob" Nickerson of New York's Combustion Engineering office certainly should know the charming Carolyn.

Just to show you that the new Vice President of the Federation takes his job seriously, here he is taking pictures in the screen house at the Nut Island Plant in Boston. He, of course, is Ralph E. Fuhrman, Supt. Blue Plains Sew. Treat. Plt., Washington, D.C.



* * *

Did you ever wonder what some people do when they go to a convention? Well, Rolf (M.I.T. Prof. of San. Engr.) Eliassen and Ed (Ohio River Compact Comm. Exec. Dir.) Cleary go swimming—in a pool.

And while more than 500 persons dined at the annual banquet of the Federation, Clarence E. (Baltimore Sewage Treatment) Keefer read a Who-Dun-It.

* * *

As is customary, the extra-curricular activities at the Federation meeting included gorging one's self at the famous eating places of the host city and room hopping. We (Gin and I) got down to "Ye Olde Oyster House" with George (Green Bay, Wis.) Martin and Don (Purdue Univ.) Bloodgood, and also to Locke-Ober's with Ralph and Jo (Washington, D.C.) Fuhrman and Mrs. George (Glenside, Pa.) Mebus. Several persons recommended the Red Coach Grill, Pieroni's, and Durgin-Park, but we didn't have time.

* * *

One spot where we stopped off was for the express purpose of getting some Wisconsin cheese. Two weeks before the meeting, I had received a letter from Jake Klein, Supt. of Sew. Treat. at Sheboygan, Wis. (the City of Cheese, Chairs, Children, and Churches). Jake said he would have an eight-pound head of cheddar cheese to open on Tuesday night in the Dorr Co. room. By the time I got there it was almost all gone.—Must be a lot of other persons who like cheese. (Incidentally, when Jake wanted to store the cheese

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in the Statler refrigerator, he had to sign a release holding the hotel not responsible in case it should spoil.)

* * *

Speaking of cheese—just 36 hours before I left home to attend the Fed. meeting in Boston, I arrived home from the meeting of the Wisconsin Section of A.W.W.A. in Milwaukee. —I almost, but not quite, had my fill of cheese there, thanks to Jos. P. Schwada (Milwaukee City Engineer) and Zenno A. Gorder (Supt. of Util., Monroe, Wis.). Monroe not only has aged cheddar but Swiss cheese as well and Zenno brought both. He also brought some Swiss Beanies, which were quite popular and herewith you see a couple of fellows wearing them.

Self Portrait

Zenno Gorder

This fellow Gorder not only is turning out to be quite a water works man, but I predict he's going to be a sought-after comedian in this business.

* * *

When Tom McGuire, Supt. of Util. at Plymouth, Wis., and Chairman of the Wis. Sect., heard of my love of aged cheddar, he promptly sent me a goodly portion from Plymouth, where he says cheese prices for the country are set, and where, if you placed an order for 50 million pounds, it could be shipped in 24 hours.—Well, I can't use that much but I'm always in the market for either aged cheddar or good Swiss. Hint, Hint!

* * *

On a room-hopping tour one night, I got into a discussion of personal names, and mentioned that a great many people either misspell or mispronounce my name (it's like Seye-munz, you know).

Right away "Meitz" (Mrs. Dick, Gen. Chemical) Ockershausen spoke up and said, "You have it easy. People not only can't spell and pronounce Ockershausen, they can't even remember it."—As proof—

Dick is a member of his village school board and on one occasion the board was discussing repairs to

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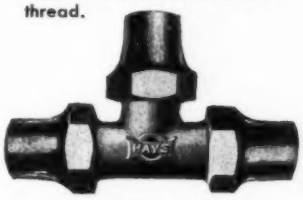
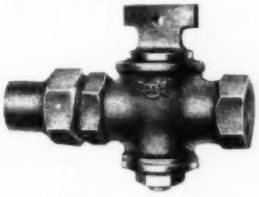
Hays Corporation Stop with inlet A. W. W. A. standard thread.



CATALOG No. 5622
Hays Tee for copper to copper to copper connection.



CATALOG No. 5050
Hays Curb Stop for iron pipe to copper service connection.

CATALOG No. 5628
Hays Elbow for Male iron pipe to copper connection.

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the schools with an architect. As he, the architect, prepared to leave, he said good night to each of the board members. It was apparent that he was leaving Dick until last, but at last there was no one else to say good night to, so with a final moment of hesitation, he turned to Dick and said, "Good night—Mr.—Quackenbusch."

* * *

One of the stories going around the Hotel Statler at the Fed. meeting concerned F. W. (Kit) Kittrell of T.V.A. and the peripatetic "Pete" Wisely. "Kit" was explaining that as part of a membership drive of the Ky.-Tenn. Sew. & Ind. Wastes Assn., they had planned to have two girls on the desk to solicit new members. One was to be a blonde for Kentucky and the other a brunette for Tennessee.

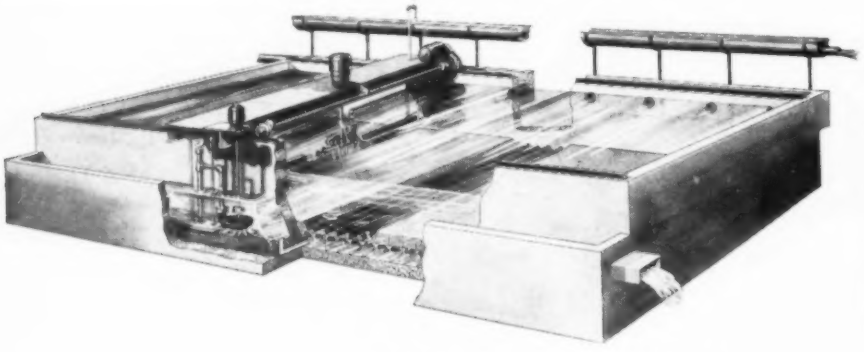
"Kit" said that of each $5 the girls collected from the new members, they were to turn over $3 to "Pete" Wisely. "And now," says 'Kit,' "Wisely wants $5 and we'll have to raise the price for the girls."—

Anyway, that's the way the story was told to me.

* * *

Inasmuch as I've run out of space for this issue, I'll start the year 1950 out with a number of letters I've received—and a recipe for Shrimp ala Shorb.—Right now, let me be the first to wish you a very Merry Christmas and a Prosperous New Year!

V.T.Y.—Doc.



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The secret of this remarkable filter lies in its special, compartmented filter bed and traveling backwash mechanism which automatically cleans and removes the sludge from one compartment at a time—on a pre-determined time cycle or with increase in head pressure.

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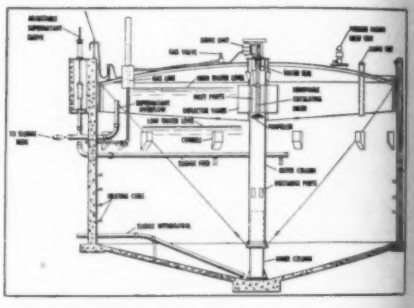
MANUFACTURERS' and EQUIPMENT NEWS

1200

Dorr MA Digester

The Dorr Co., Stamford, Conn., has announced a new Dorr Type MA Digester. Designed especially to serve the needs of a community where single stage digestion is applicable, the type MA unit is unique in that it combines intensive mixing and provision for gas storage together in a single unit.



As can be seen from the accompanying sectional diagram, the high capacity mixer with the draft tube maintains a homogeneous sludge mixture and prevents scum formation. Gas storage is sufficient to handle 25 to 35 per cent of daily production.

In operation, a predetermined amount of supernatant liquor is decanted through an adjustable sleeve valve once or twice daily, after which an equivalent supply of raw sludge is added. The mixer is then turned on, and thirty minutes is usually sufficient to turn over the entire tank contents and create a homogeneous sludge mixture, thereby seeding the raw sludge and at the same time eliminating any scum formed during the previous quiescent period. Temperature is maintained either by internal heating coils, or by an external heat exchanger.

(*Continued on page* 93A)

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Address .....

.....

WATER & SEWAGE WORKS READER SERVICE

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

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WATER & SEWAGE WORKS READER SERVICE

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Your name .....

Title .....

Company or Dept. .....

Address .....

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WATER & SEWAGE WORKS READER SERVICE

READER SERVICE CARDS HOW TO USE THEM

Please fill out a separate coupon for each item on which you desire information. This will greatly facilitate handling.

Key number is at head of each new product, item of equipment, catalog or bulletin, described in this issue.

Enter key number in box.

Please PRINT your name and title, company or department name, and your address

NOTE—

These cards are to be used only for items described in THIS ISSUE

WATER & SEWAGE WORKS

Will see that you receive information desired.

(Continued from page 92A)

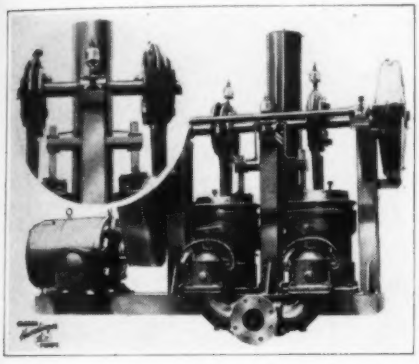
To obtain further information on this new Digester unit, use a Reader Service Card on which is entered the above key number and your name and address.

1201

Plunger Sludge Pump

Carter Offers New Crosshead Guide Assembly

The Ralph B. Carter Co. of Hackensack, N.J., has announced a new modified design optional for their entire line of plunger sludge pumps. This exclusive new feature, the Crosshead Guide Assembly, can be furnished when specified on both Carter standard and the balto model, in all three sizes, single, double and triple plunger.



The new Assembly consists of a steel crosshead guide rod, rigidly secured to each plunger, and its use may be expected to increase pumping efficiency and cut down maintenance "down time." The main advantages of this design modification are to eliminate misalignment of the plunger and any tendency toward eccentric motion of the plunger in the vertical path. This also reduces possibility of excessive wear on the packing gland; as well as wear on the plunger and cylinder.

To obtain further information on this new design, use a Reader Service Card on which is entered the above key number and your name and address.

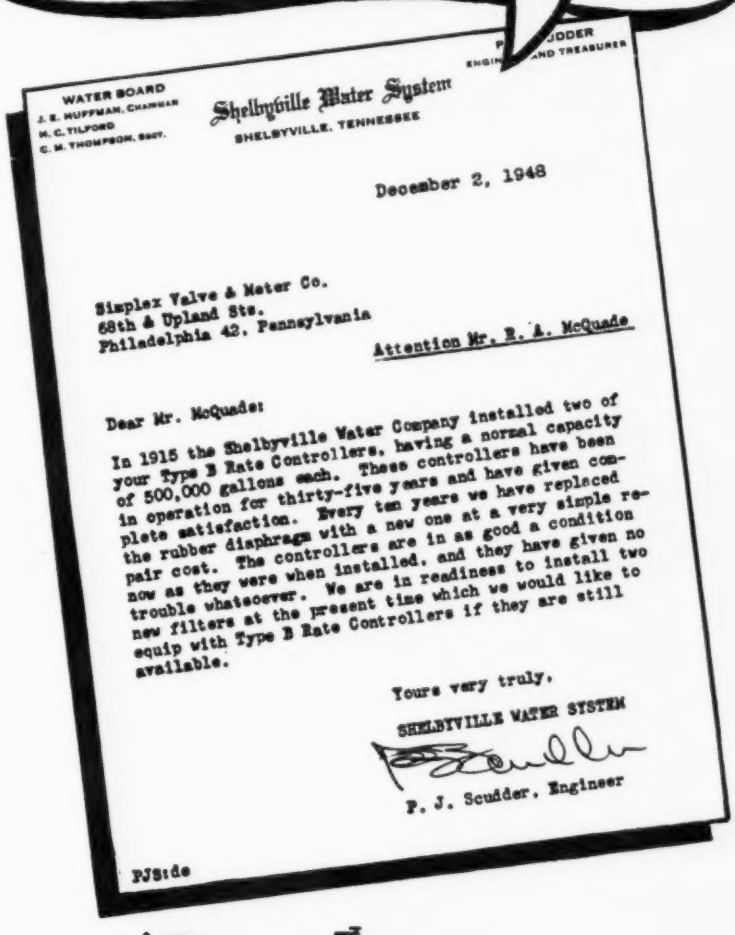
Rockwell Annual Report Wins Trophy

Rockwell Manufacturing Co. of Pittsburgh was judged as having the best 1948 annual report of the metal products industry in the Financial World Annual Report Survey. The bronze "Oscar of Industry" trophy was presented to W. F. Rockwell, Jr., president of the company at the Annual Awards Banquet in New York on October 31.

Here's proof SIMPLEX is the finest...

"IN OPERATION 35 YEARS— COMPLETE SATISFACTION"

...says P. J. Scudder, Engineer, Shelbyville Water System



WATER BOARD
J. E. HUFFMAN, Chairman
H. C. TILFORD
C. M. THOMPSON, Secy.

Shelbyville Water System
SHELBYVILLE, TENNESSEE

December 2, 1948

Simplex Valve & Meter Co.
68th & Upland Sts.
Philadelphia 42, Pennsylvania

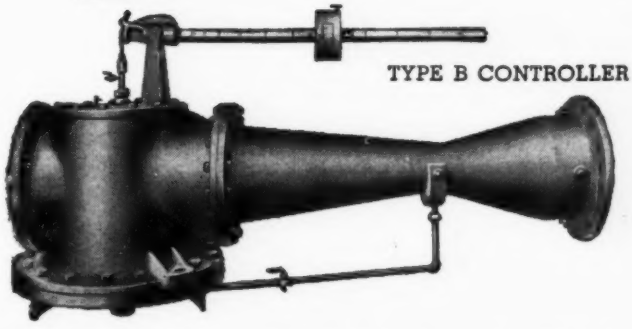
Attention Mr. E. A. McQuade

Dear Mr. McQuade:

In 1915 the Shelbyville Water Company installed two of your Type B Rate Controllers, having a normal capacity of 500,000 gallons each. These controllers have been in operation for thirty-five years and have given complete satisfaction. Every ten years we have replaced the rubber diaphragm with a new one at a very simple repair cost. The controllers are in as good a condition now as they were when installed, and they have given no trouble whatsoever. We are in readiness to install two new filters at the present time which we would like to equip with Type B Rate Controllers if they are still available.

Yours very truly,
SHELBYVILLE WATER SYSTEM
P. J. Scudder, Engineer

PJS:de



TYPE B CONTROLLER

The Simplex Valve & Meter Company, Dept. 12, 6743 Upland Street, Philadelphia 42, Pa

SIMPLEX

VALVE AND METER COMPANY

Graver Water Conditioning Co. Organization

The Graver Water Conditioning Co. was recently formed to expand the water treatment and liquid conditioning service of the Graver Tank and Mfg. Co. With the formation of this separate company, offices were set up in New York City at 216 West 14th St. Henry T. Sulcer was appointed General Manager of the Graver Water Conditioning Co. and Mr. Edward W. Welp, formerly Sales Manager of the Graver Water Treating Div., was appointed Asst. General Manager. To head up the technical services of the new company, Vincent J. Calise was appointed as Director of the Technical Div. Mr. Calise has had many years of experience in the selection of processes and the design of equipment for all liquid conditioning services and in solving chemical and mechanical water treatment problems.

S. D. Barr, who was previously in charge of Eastern District Sales, has been advanced to the position of General Sales Manager with offices in New York.

At the same time that the New York Office was set up with the above personnel, field offices were established in Cleveland with Herman Ross in charge, in Philadelphia with Robert Schenker in charge, and in Chicago with Harold Fosnot in charge. Emmett Cordes is in charge of field service and is located in the Chicago office.

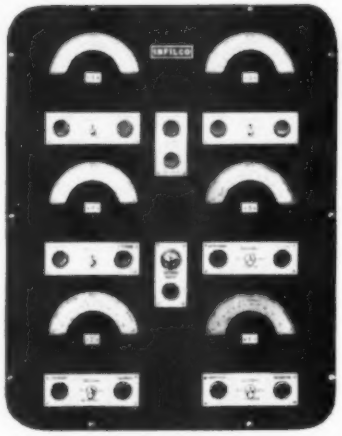
Water Treatment Plant . . . Muskogee, Okla.

ACCELATOR®

With Infilco PUSH BUTTON FILTER CONTROL Gives Muskogee Greater Capacity in Far Less Space!

An ACCELATOR only *70 feet square* softens and clarifies TWICE as much river water for Muskogee, Okla., as the former method did in a space 210 feet square! Extreme flexibility of operation with a remote push button filter control system centralized on one panel, is a feature of this highly satisfactory installation. The flow through all filters is maintained at a uniform rate and increased or decreased as desired by simply pressing the proper button!

ACCELATORS invariably give simpler operation, faster chemical reaction, higher ratings and an exclusive slurry recirculating feature which produces better, clearer water in less time. They can effect up to *80% savings in space!* Mixing, coagulating, settling, and sludge removal . . *all* these operations are replaced in ONE COMPACT UNIT! ACCELATOR installations are now economically treating over *One Billion* Gallons of water daily. Get all the facts. Send for our new 28 page bulletin No. 1825. Write today!



INFILCO

BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1894

INFILCO INC.

GENERAL OFFICES: 325 WEST 25th PLACE • CHICAGO 16, ILLINOIS

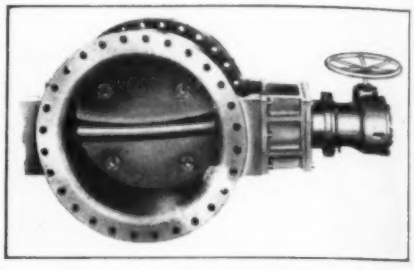
SALES OFFICES IN TWENTY SIX PRINCIPAL CITIES

WORLD'S LEADING MANUFACTURERS OF WATER CONDITIONING AND WASTE TREATING EQUIPMENT

1202

Rubber Lined Valve

R-S Products Corp., Philadelphia, Pa., has announced a new "Type No. 709" 30-inch 50-pound cast iron valve equipped with 125-pound



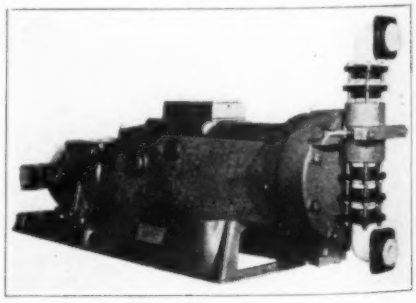
flanges and a renewable one-piece rubber seat for positive shutoff. The valve is air-bubble tight at 80 psi. and drip tight with water at 100 psi. It is easily adapted to automatic control.

For further information on this valve, use a Reader Service Card on which is entered the above key number and your name and address.

1203

Chemical Proportioning Pumps

Announcement has been made by the Process Equipment Div. of Lapp Insulator Co., Inc., LeRoy, N.Y., of



a new line of its Pulsafeeder Chemical Proportioning Pumps with ceramic wet-end parts.

In this new model, reagent-head, valves, and valve housing are armor-encased solid porcelain; gaskets, valve seat, and diaphragm are of inert fluorinated hydrocarbon plastics (Teflon and Kel-F.)

By eliminating all metal parts which can come into contact with fluids being pumped, the "ceramic wet-end" Pulsafeeder greatly increases the scope of corrosive liquid control.

Like all Lapp Pulsafeeder pumps, the new model provides for metered pressure pumping, and the flow-rate is adjustable while the pump is in operation.

To obtain further information on this new type of Chemical Proportioning Pump, use a Reader Service Card on which is entered the above key number and your name and address.

1204

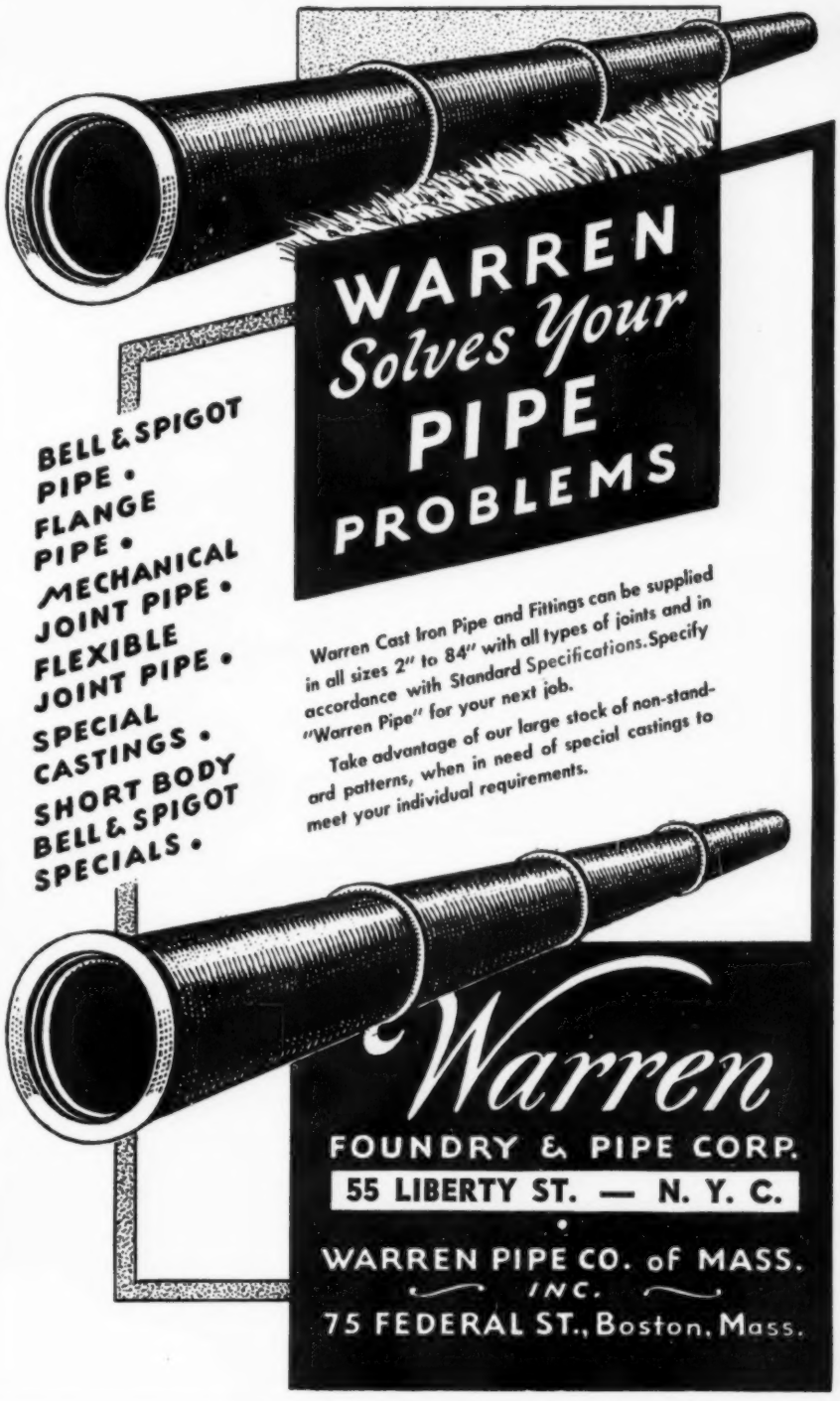
Abrasive Pipe Saw

The Porter-Cable Machine Co., of Syracuse 8, N.Y., has developed a new abrasive Speedmatic Saw to make pipe cutting easy. The Speedmatic Saw is equipped with an abra-

sive wheel cutting section, which is abrasive throughout the entire body of the blade rather than on the cutting edge alone. The Speedmatic Saw deeply scores even the heaviest cast iron pipe quickly and easily.

This new saw is adapted for quick on-the-job cutting, and can be easily adapted to follow the contour of the pipe. The abrasive wheel can be adjusted for a cut of ⅛ of an inch for each turn. This Speedmatic Saw will cut not only cast-iron, but any kind of metal, ceramic, or plastic material, and will cut tile or concrete pipe, bricks, cement or cinder blocks.

To obtain further information on this new unit, use a Reader Service Card on which is entered the above key number and your name and address.


WARREN
Solves Your
PIPE
PROBLEMS
BELL & SPIGOT PIPE •
FLANGE PIPE •
MECHANICAL JOINT PIPE •
FLEXIBLE JOINT PIPE •
SPECIAL CASTINGS •
SHORT BODY BELL & SPIGOT SPECIALS •
Warren Cast Iron Pipe and Fittings can be supplied in all sizes 2" to 84" with all types of joints and in accordance with Standard Specifications. Specify "Warren Pipe" for your next job.
Take advantage of our large stock of non-standard patterns, when in need of special castings to meet your individual requirements.
Warren
FOUNDRY & PIPE CORP.
55 LIBERTY ST. — N. Y. C.
WARREN PIPE CO. of MASS.
INC.
75 FEDERAL ST., Boston, Mass.

To improve floc formation

N-SOL PROCESSES FOR WATER COAGULATION

use "N"® Sodium Silicate to produce

ACTIVATED SILICA SOL.

A reactant such as ammonium sulphate, chlorine or sodium bicarbonate with "N" Silicate yields N-Sol (activated silica sol).

Write for bulletins.

PHILADELPHIA QUARTZ CO.

1166 Public Ledger Bldg., Phila. 6, Pa.

BOND-O

A safe self-caulking, self-sealing compound for jointing water mains. Used with complete confidence. Machine-blended for absolute uniformity. All BOND-O contains a germicide to inhibit oxidation by sulfur bacteria.

Northrop

Northrop & Company, Inc.

SPRING VALLEY, N. Y.

Every Bond-o Joint is a Good Joint

Refinite To Build Hays Contact Aeration Units

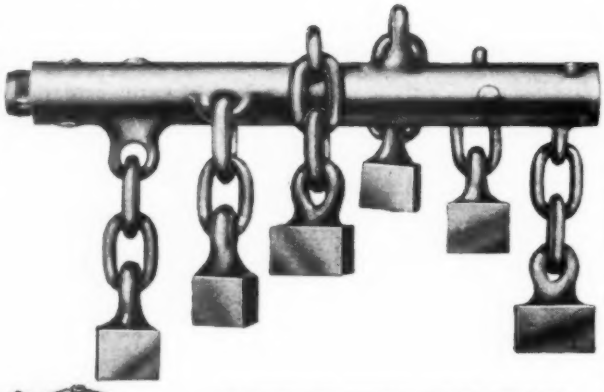
Announcement has been made by Charles A. Spaulding, Jr., General Manager of the Refinite Corp. of Omaha, Neb., that his company has acquired the manufacturing and sales rights of the original Hays Contact Aeration Method for sewage treatment. The new Refinite-Hays system supplies a perfected method growing out of experiments conducted nearly twenty years ago by Clyde C. Hays, city chemist and bacteriologist of Waco, Texas.

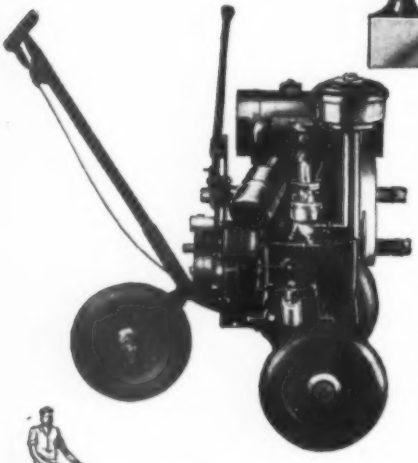
Charles A. Spaulding, Jr.

Three new improvements have recently been incorporated in the Hays system. These include (1) new non-clogging grids to replace perforated pipes and to prevent possible corrosion of air grid orifices and a resultant poor diffusion of air. (2) Specially designed contact plates are used in place of the asbestos-cement plates employed as contact media heretofore. (3) A patented process for separate treatment of digester-supernatant is now successfully used and eliminates previously encountered return of septic digester-supernatant liquor, which caused improper functioning.

PRACTICAL PIPE LINE CLEANING TOOLS FOR PRACTICAL MEN

"Flexible" Power Tools for Cleaning Pipe in Short Sections—in Diameters Ranging from 4 Inches to 12 Inches.





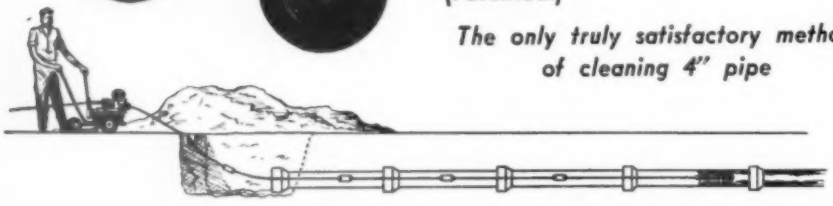
"FLEXIBLE" CHAIN HEAD AUGER

Cleans right down to the metal. Has never been known to break a pipe or damage a corporation cock. (Patented.)

"FLEXIBLE" POWER DRIVE

Powerful, portable power drive unit. Simple, safe to handle. Furnished with dependable 4 H.P., plus engine. (Patented.)

The only truly satisfactory method of cleaning 4" pipe



"FLEXIBLE" EQUIPMENT NOW FOR SALE, LEASE OR CONTRACT.

Write the nearest office today for full particulars.

FLEXIBLE UNDERGROUND PIPE CLEANING CO.

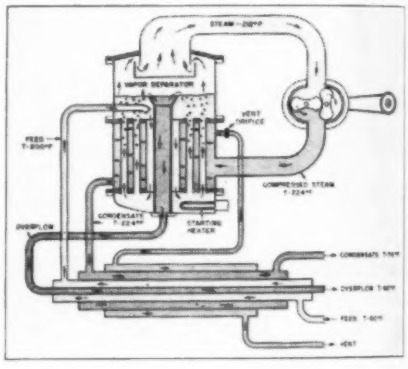
9059 Venice Blvd., Los Angeles 34, California

141 W. Jackson Blvd. Chicago, Ill.
29 Cordan Ave. Roslindale 31, Mass.
481 Broadway New York 13
P. O. Box 447 Lancaster, Texas
147 Hillside Ter. Irvington, N. J.
41 Greenway St. Hamden, Conn.
P. O. Box 165 Atlanta
3786 Durango Ave. Los Angeles 34, Calif.
2011 Central Ave. Memphis, Tenn.
909 N. Homewood Ave. Pittsburgh 8, Pa.
801 E. Excelsoir Blvd. Hopkins, Minn.
4455 S.E. 24th Ave. Portland 2, Ore.

1205

Compression Distillation

Arthur D. Little, Inc., Chemists & Engineers, Cambridge 42, Mass., has announced a new Compression Distillation Process, which appears to have many industrial applications. This compression still can be operated to produce distilled water at low cost. A single compression distillation will remove all traces of organic



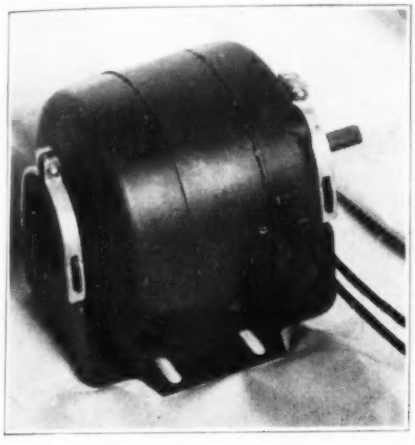
and mineral solids, including silica, and such persistent gases as ammonia. It requires no cooling water, it is simple of operation and flexible. These compression distillation units have been found useful in making fresh water wherever impure water is available. They are useful in making industrial process water in chemical plants, breweries, distilleries, paper mills, ice plants, railroads, utilities and industrial power plants; and of particular interest is the fact that they can be used for concentrating industrial solutions such as waste products from penicillin, beer, lignin waste, and other similar types of material. This is practically a process of distillation without heat. Although some heat is used, it is almost all recoverable and therefore re-usable.

To obtain further information on this unique and interesting unit, use a Reader Service Card on which is entered the above key number and your name and address.

1206

All-Angle Operation Motors

General Electric Co., Schenectady 5, N.Y., has announced development of a new line of lifetime oil-lubricated, shaded-pole motors designed for operation in any position—shaft up, down, horizontal, or in any intermediate angle. These unit bearing motors



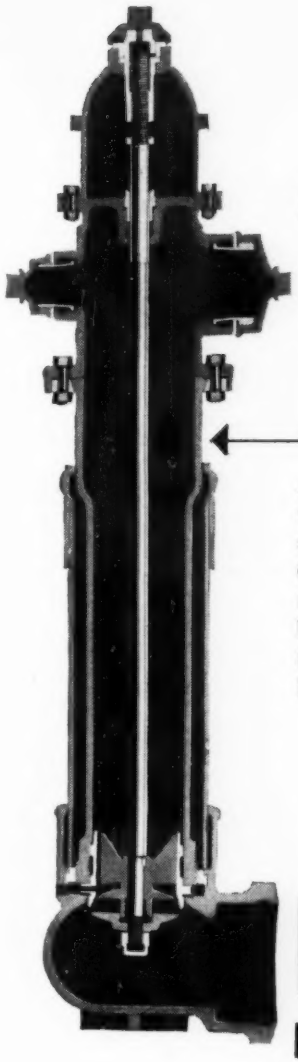
are available in either open or totally closed construction, and can be used as drives for exhaust fans, cooling fans, evaporative coolers, unit heaters, condenser cooling, space heaters, as well as for small pumps, agitators, and blowers, or almost any use to which a motor can be put in a water or sewage treatment plant.

To obtain further information on this new motor, use a Reader Service Card on which is entered the above key number and your name and address.

Sargent Co. Completes New Chicago Plant

The E. H. Sargent Co. has recently completed a new and modern building for the Chicago offices and plant. The new plant will have space for the engineering and drafting offices; production, merchandise handling; the instrument factory; physical and chemical laboratories; preparation laboratory; glass-blowing shop, etc.

The new building located at 4647 West Foster Ave., Chicago 30, Ill., is expected to increase the facilities of the company for handling laboratory instruments and chemicals.



ACCESSIBILITY

A Mathews broken in a traffic accident can be restored WITHOUT EXCAVATING, because of the unique replaceable barrel, and with only a few minutes' interruption in service.

MATHEWS HYDRANTS

Made by R. D. Wood Company

Public Ledger Building, Independence Square
Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves.

THE FIREMAN'S FRIEND

Mathews Modernized Hydrants Set the Pace: Easily maintained because simple in construction • All working parts contained in the replaceable barrel • Stuffing box cast integral with nozzle section • Head can be turned 360° • Replaceable head • Nozzle sections easily changed • Nozzle levels raised or lowered without excavating • Protection case of "Sand-Spun" cast iron for extra strength, toughness, elasticity • Operating thread only part to be lubricated • A modern barrel makes an old Mathews good as new

DARLEY MAGNETIC DIPPING NEEDLE $17.50

with 3 section telescoping handle $22.25

Write Today for 68-Page Catalog

W. S. DARLEY & CO., Chicago 12

ANTHRAFILT

Trade Mark Reg. U. S. Patent Office

A Filter Medium For All Purposes

ANTHRACITE EQUIPMENT CORP.

Anthracite Institute Building
Wilkes-Barre, Pa.

All correspondence regarding sales and engineering should be addressed to:

PALMER FILTER EQUIPMENT CO.

822 E. 8th St. Erie, Pa.

Engineers and Sales Agents

P. S. Wilson Manufacturers' Agent for Energy Control

P. S. Wilson, manufacturers' agent of Glenn Ridge, N.J., has broadened his service to the water and sewage works industry by becoming an agent for Energy Control Co., Inc., of New York. In addition to the Bethlehem Flow Tube, this company has a number of metering and control devices which will find use in these fields as well as in industrial waste treatment. Mr. Wilson also represents Atlas Mineral Products, and the Gregg Co.

1207

Alkalinity Test Paper

The LaMotte Chemical Products Co., Towson 4, Baltimore, has developed a new set of test papers for differentiating between Caustic Alkalinity, Carbonate Alkalinity and Bicarbonate Alkalinity.

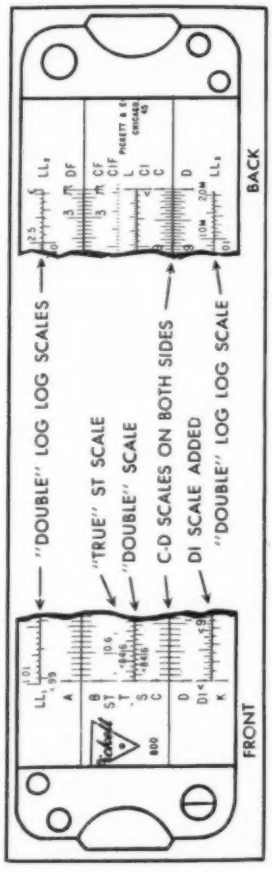
These new test papers should find wide use in chemical manufacturing, water supply, and sewage and industrial waste treatment industries. A compact and inexpensive kit is available, consisting of three vials of selected indicator papers.

To obtain further information on this new test paper set, use a Reader Service Card on which is entered the above key number and your name and address.

1208

New Log Log Slide Rule

Pickett & Eckel, Inc., Chicago, Ill., has developed a new engineering 10-inch Log Log Slide Rule which is simplified by a new double scale. This new double scale simplifies the long-established, traditional Log Log Scale arrangement and accomplishes four



things not done before in slide rule operations. It places the six Log Log Mated Scales together to make three Double Scales. It provides an extra area needed to place C scales on both sides. It permits inclusion of the much needed DI scale, and by its arrangement it not only permits addition of the extra C and DI scales, but transforms the complex-looking maze of lines into a simpler looking, easier to use, easy to understand rule.

To obtain further information on this new all metal slide rule, use a

Operating results attest overall efficiency . . . . . of

YEOMANS Spiraflo CLARIFIER with tangential inlet

Radically different from other types of clarifiers, Yeomans Spiraflo Clarifier is demonstrating in scores of installations its exceptional efficiency in BOD and solids removal—results directly attributable to these design features:

- Sewage enters the main clarification compartment at the bottom, after having spiraled through an annular race around the periphery of the tank
- Scum, grease oil and floatable materials are automatically removed from the annular race—therefore cannot pass on to the filter and clog distributor nozzles
- Raw sewage flows upward through a sludge blanket toward centrally located effluent weirs—increases flocculation and removal of solids
- Construction costs are minimized because of straight-wall design and elimination of costly reinforced concrete effluent troughs
- Pre-aeration can be accomplished inexpensively by installing air diffusion tubes in the race

Spiraflo clarifiers can be installed in water treatment and in either trickling filter or activated sludge sewage treatment plants. A highly efficient overall plant reduction is achieved when the Spiraflo is used in conjunction with the "Aero-Filter" high capacity trickling filter system. Spiraflo clarifiers are the logical choice for primary treatment plants, especially those treating strong industrial wastes.

Bulletin 6790 contains full information with performance data and construction cost estimates—write us for it.

YEOMANS

YEOMANS BROTHERS COMPANY, 1411 North Dayton Street, Chicago 22, Illinois

Reader Service Card on which is entered the above key number and your name and address.

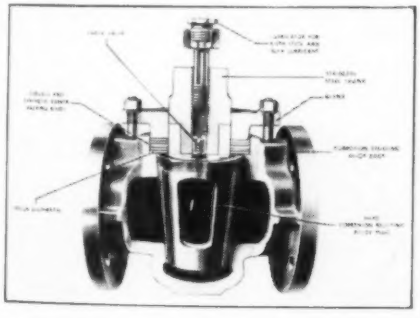
A. M. Younger Vice President Atlas Mineral Products

Announcement has been made of the election of A. Myles Younger as Vice President in Charge of Sales for the Atlas Mineral Products Co. Mr. Younger joined the firm as a Chemical Engineer in 1939. He was formerly General Sales Manager.

1209

Corrosion Resisting Plug Valve

The Duriron Co., Inc., New York 17, N.Y., has announced a new Durco type A corrosion resisting plug valve. It embodies the general design principles of the Durco top lubricated plug valve made since 1921, but the new development contains many features including a composite plug, made of corrosion resisting alloy, and body and gland made with regularly stocked Durimet 20, with the packing for the stuffing box consisting of a combination of corrosion resisting and resilient packing rings and a Teflon antifriction packing seal.



These features enable the Durco Type A plug valve to handle almost every type of corrosive material at reasonable cost.

To obtain further information, use a Reader Service Card on which is entered the above key number and your name and address.

"6 tons per hour"

with a

ROYER SLUDGE DISINTEGRATOR

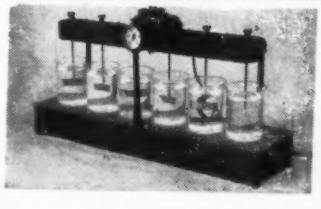
"Two men shovelling put six tons of sludge through the machine in one hour. It would easily shred eight tons per hour without overloading the machine"—reports S. J. Shoemaker of Waverly, N. Y. of his Model NSO Royer Sludge Disintegrator.

If your sewage plant has not yet installed a Royer machine, write us for a free copy of SEWAGE SLUDGE DATALOG and get all the facts on the low cost of installing and operating a Royer . . . and turning sludge into commercially saleable fertilizer . . . as against the high cost of burning or burying it.

ROYER

PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

ROYER FOUNDRY & MACHINE CO.
170 PRINGLE ST., KINGSTON, PA.



Phipps & Bird
LABORATORY MIXER

IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.

PHIPPS & BIRD, INC. Richmond, Va.

ZECO GREENSAND ZEOLITE

ZECO and HI-ZECO Greensand Zeolite for water softening, filtration and iron removal. ZECO Manganese Zeolite for iron and manganese removal. COREXITE mineral for corrosion control and water stabilization.

ZEOLITE CHEMICAL CO.
Sales Office 140 Cedar St., New York, N.Y.
Factory Medford, N.J.
Pioneer Producer of GREENSAND ZEOLITE MINERAL

1210

Buffer Solutions

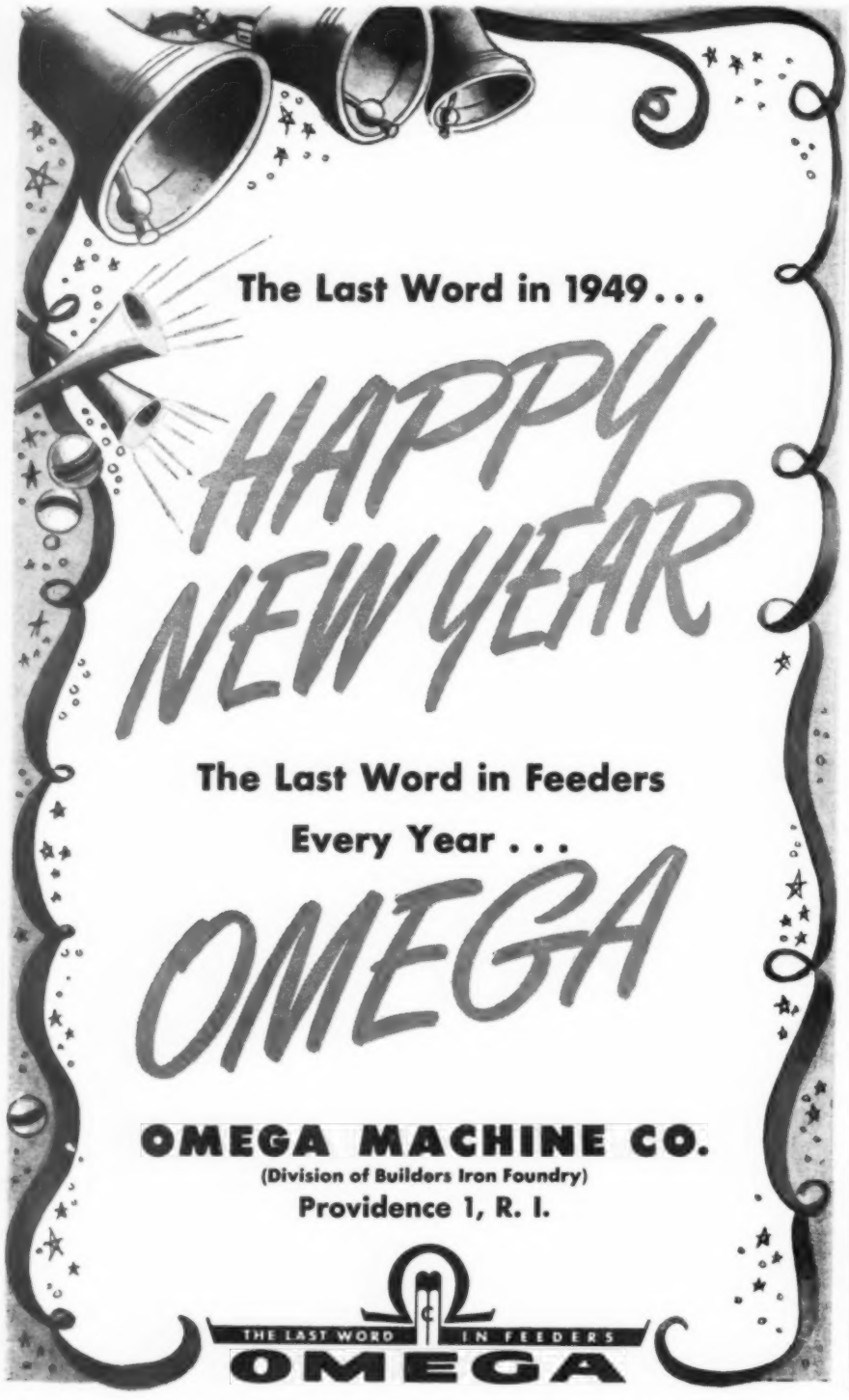
Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa., has announced a new line of buffer solutions for calibrating any pH instrument.

The nominal pH values are 4, 7 and 9; with the actual values being at 4.01, 6.86, and 9.16 at 25° Centigrade. Solutions are supplied in 1 pt. unbreakable, non-contaminating, reusable bottles. The buffers are checked, after bottling, to National Bureau of Standards specifications.

To obtain further information on the pH Buffer Solution, use a Reader Service Card on which is entered the above key number and your name and address.

Warren Foundry To Move N. Y. Office

The Warren Foundry & Pipe Corp. and its subsidiary, the Warren Pipe Co. of Massachusetts, Inc., has moved its New York Office from 11 Broadway to 55 Liberty Street in New York City. The new telephone number is Worth 4-7993.



1211

Versatile Power Digger

Sherman Products, Inc., Royal Oak, Mich., has announced the development of the Sherman Power Digger. This versatile digger is tractor powered and hydraulically operated. It is designed to fill the gap between expensive hand labor and existing costly excavating equipment.

The digger works behind the tractor or at an angle and dumps on either side of the tractor. All digger motions are hydraulic. There are no rack gears, cables, reels, clutches or chains. The shovel has a below ground surface reach of six feet and an 11-foot digging reach behind the tractor. It can be operated at the rate of 50 lineal feet per hour at 6-foot depth. The standard shovel cuts an 18 in.-wide trench and has a capacity of 3½ cu. ft. It can be installed or removed from a tractor in 30 to 45 minutes.

For further information on this new unit, use a Reader Service Card on which is entered the above key number and your name and address.

Hooker Promotes H. C. Miller

Harris C. Miller has been promoted to the sales staff of the Hooker Electrochemical Co. He has been assigned to the New York City sales area with headquarters at 60 East 42nd St. Mr. Miller has been associated with Hooker since 1941 in various capacities, including process study engineer, and on special plant engineering and production assignments.

1212

Ebony Paint

Ebony Paint Mfg. Co., Kansas City, Mo., has been making Ebony paint for more than 60 years as a protective paint for metal surfaces. Ebony paint is not an ordinary oil and pigment paint; it is a refined coal tar base where the bituminous oil and pigment are alloyed into one homogeneous mass. When Ebony paint is applied to metal surfaces, polymerization occurs as the solvent evaporates, and the tar molecules flow together, forming an unbroken film which is tough and elastic and remains unbroken for years.

Being acid resistant and water resistant, this paint should be especially valuable around water and sewage plants. Although it has been manufactured for many years, its use in this field has not been so well known. It should be.

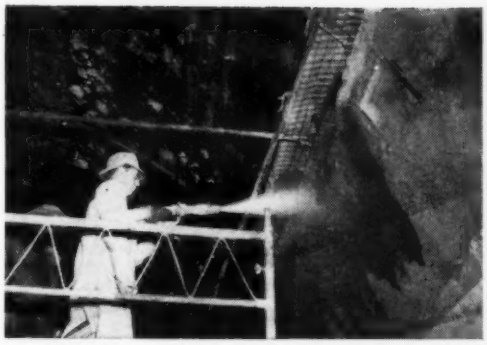
To obtain further information about this protective coating, use a Reader Service Card on which is entered the above key number and your name and address.

1213

Ice and Snow Remover

The Chemical Industrial Co., Cleveland, Ohio, has announced a new safe, effective, quick and easy way to use chemical ice and snow remover, known under the trade name MELT. It is a chemical powder in small pellets which eliminates the necessity for shoveling snow or chipping ice. Fast and effective with 99 per cent activity, its thawing capacity is rated at 12 times greater than salt. It will not damage tires, shoes, asphalt surfaces or concrete. It is available in 25 lb. pails, 100 and 200 lb. drums, and by the ton.

To obtain further information about this chemical ice and snow remover, use a Reader Service Card on which is entered the above key number and your name and address.



HOLLAND TUNNEL REPAIRED QUICKLY WITH "GUNITE" AFTER SPECTACULAR FIRE

Even before the recent Holland Tunnel fire had been completely extinguished, the Port of New York Authority was at work on the problem of restoring the tube to full usage. Work had to be done as quickly as possible in a manner which would meet the Port Authority's extremely high standards for construction.

The Cement Gun Company was selected to do portions of the job with "GUNITE" because of our ability to meet both requirements best. Side walls and ceiling concrete were chipped back to sound material and built out to original lines with "GUNITE." The new metal ceiling was covered on the underside with 1¼" reinforced "GUNITE." Our trained crews outfitted with mobile equipment were on the spot quickly and we completed the job in an amazingly short time, despite the fact that traffic moved through the tunnel during the day and that we would work only at night.

Many instances of repair, remodeling and new construction with "GUNITE" are described and pictured in Bulletin C2400. A request on your letterhead will bring your free copy by return mail.

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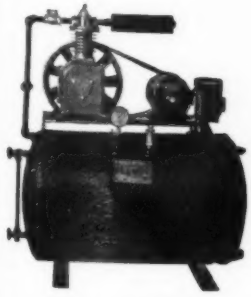
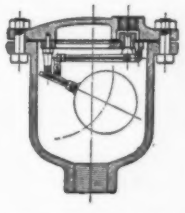


No. 2V-APCO



No. 200 VALVE

VALVE AND PRIMER CORPORATION 127 N. Dearborn St., Chicago 2, Ill.

1214

Corrosion Protection for Pipe

Bauer & Black's Industrial Tape Dept. has announced the introduction of a completely new corrosion protection coating. The new material, known as Polyken Corrosion Protection Coating, yields substantial savings in labor and equipment for pipe coating operations. It gives complete protection in a single operation, requires no heat, flame, solvents or grease. It is an oriented polyethylene film with a synthetic adhesive applied to one side. Because of its elasticity, Polyken maintains a permanent pressure around the pipe equal to the tension used in applying it, preventing the flow of moisture between the tape and the protected metal. This is something new in pipe coating.

To obtain further information on this new protective coating, use a Reader Service Card on which is entered the above key number and your name and address.

New Distributors for R. B. Carter

The Ralph B. Carter Co. of Hackensack, N.J., has announced the appointment of two new distributors for their line of Humdinger Pumps. These are the L. B. Smith Organization of Camp Hill, Pa., and the Industrial Engine and Parts Co., of Chicago, Ill.

WACHS NATIONAL PIPE SAW
Tough Cuts MADE EASY
Close quarters — only 14⅛" between 24" mains.
Two clean square cuts and the pipe comes out.

MAKE FAST AND ACCURATE CUTS ON 12" TO 48" CAST IRON AND STEEL MAINS UNDER THE MOST DIFFICULT CONDITIONS

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- Portable — weighs only 265 lbs. Two men can carry and set up unit.
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- One machine cuts all pipe sizes from 12" to 48".
- Only two adjustments necessary for size changes.

Water Departments must make tough cuts during construction work and for emergency repairs. This one portable machine will handle all your pipe cuts from 12" diameter and up. You will not only save time and labor, but you will get tight joints because of the square milled cut. Cuts cement lined pipe too. This machine is a budget must for 1950.

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LITERATURE AND CATALOGS

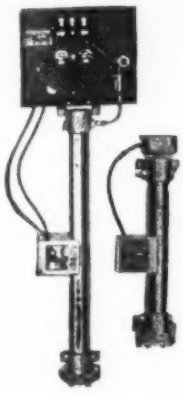
1215

SEWAGE & WASTE TREATMENT EQUIPMENT

American Well Works, Aurora, Ill., has just issued a manual on **Modern Processes and Equipment for Sewage and Industrial Waste Treatment.**

This manual contains 24 pages of illustrations and descriptions of modern processes in the treatment of sewage and industrial waste. Included in the book are the activated sludge processes with bio-activation, jet aeration and mechanical aeration; screening; grit removal; pre-treatment; sedimentation; trickling filters; sewage and sludge pumping; industrial waste treatment recovery; and flow sheets of treatment processes. Also shown are installation views of different types of equipment for the various processes.

This bulletin with its descriptions and illustrations is of interest not only to consulting engineers, but also to superintendents of sewage and industrial waste treatment plants. To obtain a copy, use a Reader Service Card on which is entered the above key number and your name and address.



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1216

60th ANNIVERSARY OF CHICAGO BRIDGE & IRON

The Chicago Bridge & Iron Co., Chicago, Ill., has issued its 60th anniversary issue of **The Water Tower.** This house organ is a regular feature published by Chicago Bridge & Iron. The most recent issue is devoted to the anniversary of the founding of the company. In addition to showing pictures of the official family, there's a story of the growth of the company illustrated with pictures from its earliest beginning to the present day.

If you are interested in the history of one of the important companies in the field of water supply and elevated storage, you should read the latest copy of *The Water Tower.*

To obtain a copy, use a Reader Service Card on which is entered the above key number and your name and address.

1217

INDUSTRIAL WASTE TREATMENT UNIT

F. S. Gibbs, Inc., Boston, Mass., has issued a bulletin titled **Progress In Pollution Elimination with the Gibbs Unit.** This bulletin describes the 650 gpm. Gibbs unit which was installed at the Proctor & Gamble Soap Mfg. Co. in Boston for the removal and recovery of fatty acids, fatty acid emulsions and insoluble soaps in waste cooling water.

The bulletin describes the study undertaken in the pilot plant and the actual operation of the present plant. Essentially the process is air flotation and a controlled neutralization of the waste. The waste material is removed by skimming and the relatively pure water may be discharged directly to sewers.

To obtain a copy of this completely descriptive bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

1218

PLUG VALVE LUBRICANTS

The Nordstrom Valve Div. of Rockwell Manufacturing Co., has issued a bulletin on the **Rockwell Hypermatic Lubricant.** This bulletin describes the miracle of automatic lubrication for Nordstrom pipe and valves. Included in the bulletin is a description of the development of the

Sanitary Engineer. Philadelphia location, some travel. With large manufacturing concern to assist plants in operation of water and waste treatment units. Applicant must be college engineering graduate with previous operating or sales experience in water and waste treatment industry or construction and design experience. Box 1027.

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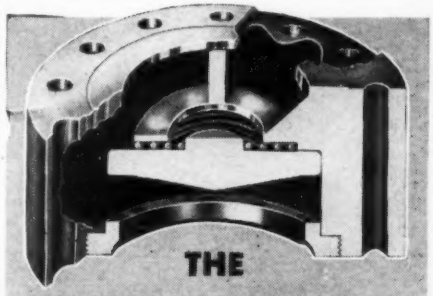
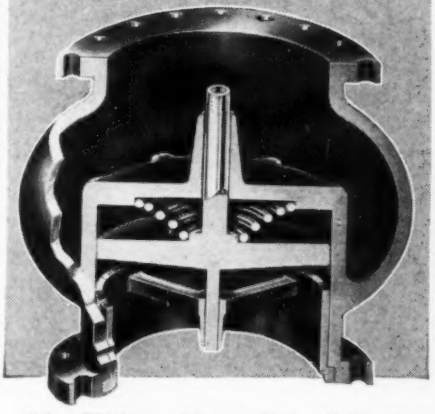


THE WILLIAMS-HAGER *flanged* SILENT CHECK VALVE



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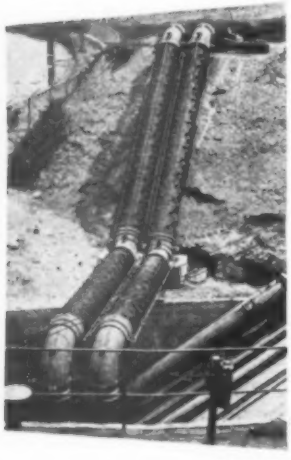

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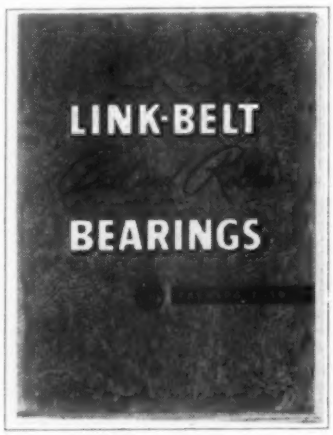
To obtain a copy of the bulletin use a Reader Service Card on which is entered the above key number and your name and address.

1219

BALL & ROLLER BEARINGS

Link-Belt Co., Chicago, Ill., has announced the completion of an entirely new 112-page catalog and engineering data book covering the



company's complete line of ball and roller bearings. The book points out the important construction features and gives a list of prices, weights, load ratings and all necessary dimensions for the various standard models available. Included in the book are descriptions of eight different bearing models and sizes.

To obtain a copy of this new engineering data book on ball bearings, use a Reader Service Card on which is entered the above key number and your name and address.

1220

VIBRATING SCREENS

The Productive Equipment Corp., Chicago, Ill., has available a 4-page bulletin on its **"Selectro" Vibrating Screens** for Industrial Waste Disposal. The bulletin describes the vibrating screen which is designed to solve the waste disposal problem

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and gives suggested installations. The bulletin also explains the key feature, the Protecto-Backed Screen. These Protecto-Backed screen cloths are attached by the company to a perforated plate backing which provides the needed strength to receive the impact of the vibrating mass. The bulletin also shows the engineering features of the "Selectro" vibrating screen including the stroke adjustment, tilting, size, oil lubrication, floating shaft, screen cloths, stabilizers, shoes, and safety features.

To obtain a copy of this bulletin on Vibrating Screens for Industrial Waste Disposal, use a Reader Service Card on which is entered the above key number and your name and address.

1221

ASBESTOS CEMENT PIPE

Keasbey & Mattison Co., Ambler, Pa., has available a small booklet on **"Century" Asbestos Cement Pipe.**

This bulletin tells of the development of asbestos cement pipe and the advantages which are obtained from "Century" Asbestos Cement Pipe. Also included in the bulletin are installation recommendations on Handling, Alignment and Grade, Trenching, etc. There is a section on the "Century" Simplex Coupling, its installation and how it works, as well as a section on cutting "Century" pipe in the field and how to make connections with cast iron pipe fittings as well as service connections. The purpose of this bulletin is to give all of the necessary information for properly laying "Century" pipe under the great majority of practical field conditions encountered. Asbestos Cement Pipe not only may be used to make "Mains Without Maintenances", but it also has found use in sewage treatment plants and in sewer systems.

To obtain a copy of this interesting bulletin on "Century" Asbestos Cement Pipe, use a Reader Service Card on which is entered the above key number and your name and address.

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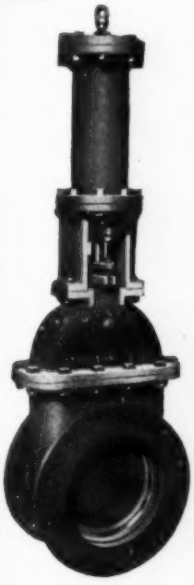

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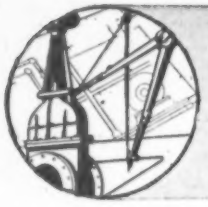

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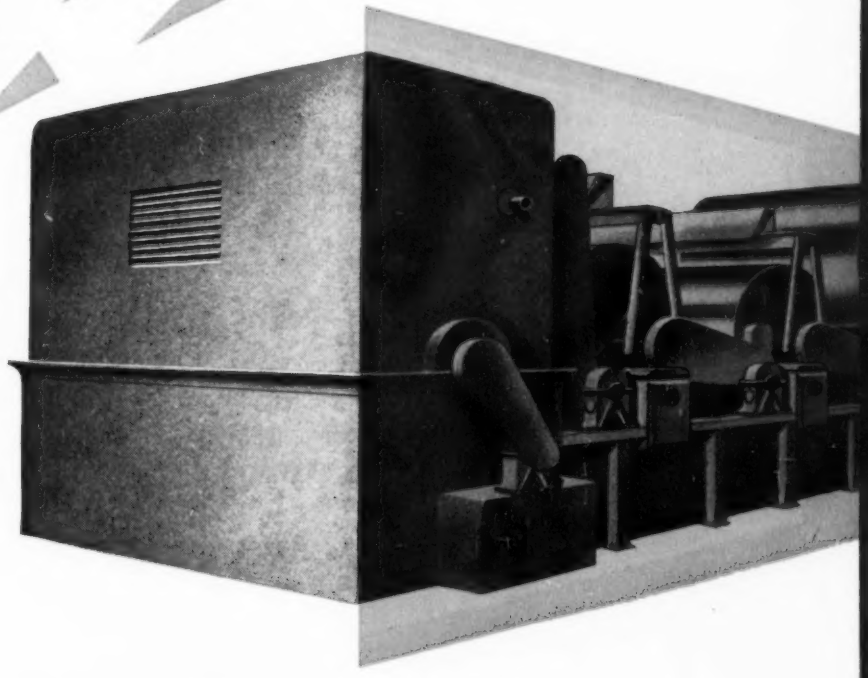

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